MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Model FR111A

# User Guide

MultiTech® Systems

# User Guide

88310550 Revision A

MultiFRAD 100-Series (Model FR111A)

This publication may not be reproduced, in whole or in part, without prior expressed written permission from Multi-Tech Systems, Inc. All rights reserved.

Copyright © 1999, by Multi-Tech Systems, Inc.

Multi-Tech Systems, Inc. makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. Furthermore, Multi-Tech Systems, Inc. reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Multi-Tech Systems, Inc. to notify any person or organization of such revisions or changes.

## Record of Revisions

| Revision | Description |
|---|---|
| **A** (4/5/99) | Manual released. All pages at revision A. |

## Patents

This Product is covered by one or more of the following U.S. Patent Numbers: ***5.301.274; 5.309.562***; ***5.355.365; 5.355.653; 5.452.289; 5.453.986***. Other Patents Pending.

## TRADEMARK

Trademarks of Multi-Tech Systems, Inc. are the Multi-Tech logo and MultiFRAD.
Windows is a registered trademark of Microsoft.

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, Minnesota 55112
(612) 785-3500 or (800) 328-9717
Fax 612-785-9874
Tech Support (800) 972-2439
Internet Address: **http://www.multitech.com**

# Contents

## Chapter 1 - Introduction and Description


Introduction ..... 6
Preview of this Guide ..... 6
Front Panel Description ..... 8
Back Panel ..... 9
    Power Connector ..... 9
    Data Connector ..... 9
    Trunk Connector ..... 9
Shunts ..... 10
Specifications ..... 11
    Data Port ..... 11
    Trunk ..... 11
    Electrical/Physical/Environmental ..... 11
    Frame Relay Compatibility ..... 11


## Chapter 2 - Installation


Introduction ..... 14
Unpacking Your MultiFRAD ..... 14
Safety Warning Telecom ..... 14
Setting Up Your MultiFRAD ..... 15
V.35 Shunt Procedure ..... 17


## Chapter 3 - Software Loading and Configuration


Installing Your MultiFRAD Software ..... 20


## Chapter 4 - MultiFRAD Software


Introduction ..... 26
Before You Begin ..... 26
MultiFRAD Configuration ..... 28
Frame Relay Setup ..... 29
WAN Port Setup ..... 31
Data Port Configuration ..... 32
Viewing Statistics ..... 33
    WAN Port Statistics ..... 34
    Frame Relay Statistics ..... 35
    Data Port Statistics ..... 37


## Chapter 5 - Warranty, Service and Tech Support


Introduction ..... 40
Limited Warranty ..... 40
    On-line Warranty Registration ..... 40
Tech Support ..... 40
    Recording MultiFRAD Information ..... 41
Service ..... 41
The Multi-Tech BBS ..... 42
    To Log on to the Multi-Tech BBS ..... 42
    To Download a File ..... 42

About the Internet ..... 43
About Ordering Accessories ..... 43

## Appendices

Appendix A - Cabling Diagrams ..... 46
Appendix B - Regulatory Information ..... 48
    Class B Statement ..... 48
    FCC Part 68 Telecom ..... 49

## Glossary

## Index

MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Chapter 1 - Introduction and Description

MultiTech® Systems

# Introduction

The Multi-Tech Systems MultiFRAD 100-series (Model number FR111A) is a one-port Frame Relay Access Device (FRAD) with 56K DSU that encapsulates non-packetized data from non-frame relay devices into frame relay packets. The MultiFRAD enables access to common carrier frame relay network services and to private frame relay networks. The access device is designed with an internal 56K Data Service Unit (DSU) that allows a single frame relay permanent virtual circuit (PVC) to be connected to a 56K DDS circuit. On the receiving end of the communication link, the MultiFRAD serves to strip away the frame relay control information so that the target device is presented with the data packaged in its original form.

The versatility of the MultiFRAD provides for a smooth integration into frame relay of existing equipment, e.g., multiplexers, routers, and legacy equipment such as cluster controllers, and for asynchronous devices such as PCs running remote control software. The non-frame relay device connects to the data port on the back of the MultiFRAD. The data port is capable of synchronous data transmission up to 128 Kbps or asynchronous data transmission up to 115.2 Kbps. The network connection is provided by the trunk port which directly connects to the frame relay network.

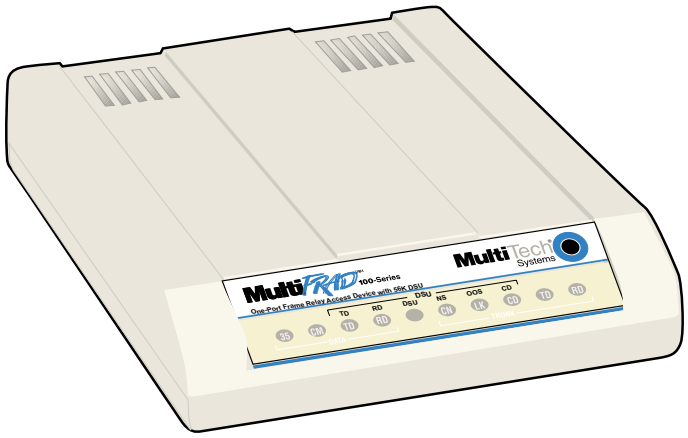



***Figure 1-1. MultiFRAD 100-Series***

# Preview of this Guide

This guide describes the MultiFRAD and tells you how to install and configure the unit. The information contained in each chapter is as follows:

### Chapter 1 - Introduction and Description

Chapter 1 describes the MultiFRAD. Front panel indicator, and back panel connector descriptions are provided. In addition, a list of relevant specifications is provided at the end of the chapter.

### Chapter 2 - Installation

Chapter 2 provides information on unpacking and cabling your MultiFRAD. The installation procedure describes each cable connection.

### Chapter 3 - Software Loading and Configuration

Chapter 3 provides instructions for software loading and initial configuration. The MultiFRAD software diskettes are Windows® based. Later chapters, as well as your on-line help program will describe the MultiFRAD software in more detail.

## Chapter 4 - MultiFRAD Software

Chapter 4 describes the MultiFRAD software package designed for the Windows ® environment. This chapter describes the software from an applications standpoint, and in so doing, not every screen is shown, nor is each field within a screen defined. For explanations and parameters of each field within a dialog box please refer to the on-line help system provided within the software.

## Chapter 5 - Warranty, Service and Tech Support

Chapter 5 provides instructions on getting service for your MultiFRAD at the factory, a statement of the limited warranty, information about our Internet presence and user bulletin board service, and space for recording information about your MultiFRAD prior to calling Multi-Tech's Technical Support.

## Appendixes

Appendix A - Cabling Diagrams

Appendix B - Regulatory Information

## Glossary

# Front Panel Description

The front panel contains three sets of LEDs that provide the status of the data, DSU, and trunk connections. The data LEDs display the activity of the data port, whether or not V.35 interface signaling is used and whether or not command mode is active. The DSU LEDs display status whether DSU is transmitting or receiving frames, when in DSU mode, when no signal is received from the network, an outage condition occurs, or when a carrier signal is received from the network. The trunk LEDs display status whether the trunk is transmitting or receiving frames, link status, congestion, and if the trunk port is set to use V.35 signaling.

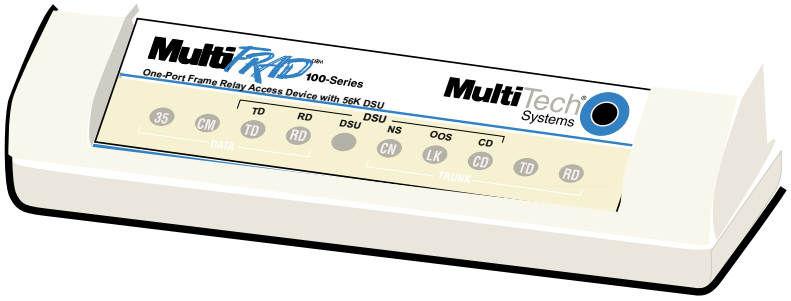



***Figure 1-2. Front Panel***

**Data**

**35** Lights when the data port is configured for a V.35 interface. That is, the data shunt is in the V.35 position.

**CM** Lights when the Data/Command mode switch is in the Command mode position.

**TD** Blinks when data is being transmitted - on for a space and off for a mark.

**RD** Blinks when data is being received - on for a space and off for a mark.

**DSU**

**Note**: These lights are valid only when the unit is in DSU mode.

**TD** Blinks when data is being transmitted - on for a space and off for a mark.

**RD** Blinks when data is being received - on for a space and off for a mark.

**DSU** The Data Service Unit (DSU) LED lights when the unit is in DSU-only mode.

**NS** The No Signal (NS) LED lights when no signal is received from the network or when the signal is too weak for normal operation.

**OOS** The Out-of-Service (OOS) LED lights when an outage condition occurs. This happens when there is a failure in the digital service that is detected by the network and the Telco sends a repetitive OOS sequence.

**CD** The carrier detect (CD) LED lights when a carrier signal is received from the network.

**Trunk**

**CN** Lights when congestion is detected on the trunk.

**LK** Blinks slowly when there is no link management connection with the network. Blinks quickly when link management is established with the network. Remains solid ON when the network indicates the PVC is active.

**CD** Lights when a carrier signal is detected.

**TD** Blinks when data is being transmitted - on for a space and off for a mark.

**RD** Blinks when data is being received - on for a space and off for a mark.

# Back Panel

The cable connections for the MultiFRAD are made at the back panel. Two cable connections are provided and one power supply connection. The Data connector allows the MultiFRAD to be connected to a non-frame relay device and the Trunk connector connects to a common carrier frame relay network service or private frame relay networks. The cable connections are shown in Figure 1-3 and defined in the following sections.

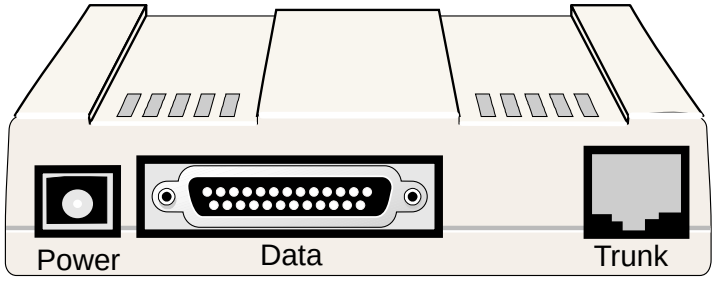



***Figure 1-3. Back Panel***

## Power Connector

The Power connector is used to connect the external wall type transformer power supply to the MultiFRAD. The wall transformer plugs directly into an AC outlet.

## Data Connector

The Data connector is used to connect the MultiFRAD to a non-frame relay device, such as, multiplexers, routers, or legacy equipment such as cluster controllers, or an asynchronous device such as a PC running remote control software. A second use of this connector is to configure the MultiFRAD. The Data connector is a DB-25 female connector located on the back panel of the MultiFRAD.

The Data connector interface can be either an RS-232C or V.35 interface. When the V.35 interface is used, the data shunt has to be moved from the default RS-232 position to the V.35 position. Refer to "Shunt" in this chapter for changing the data shunt. Refer to Appendix A for cabling requirements in V.35 mode.

## Trunk Connector

The Trunk connector is used to connect the MultiFRAD to a 56K DDS circuit that provides the local access to the frame relay service. This connector is an RJ-48 keyed jack on the back panel.

# Shunts

There are two shunt positions in the middle/right side of the printed circuit board that configure the data port for either an RS-232 or V.35 interface. The shunts are shown in Figure 1-4.

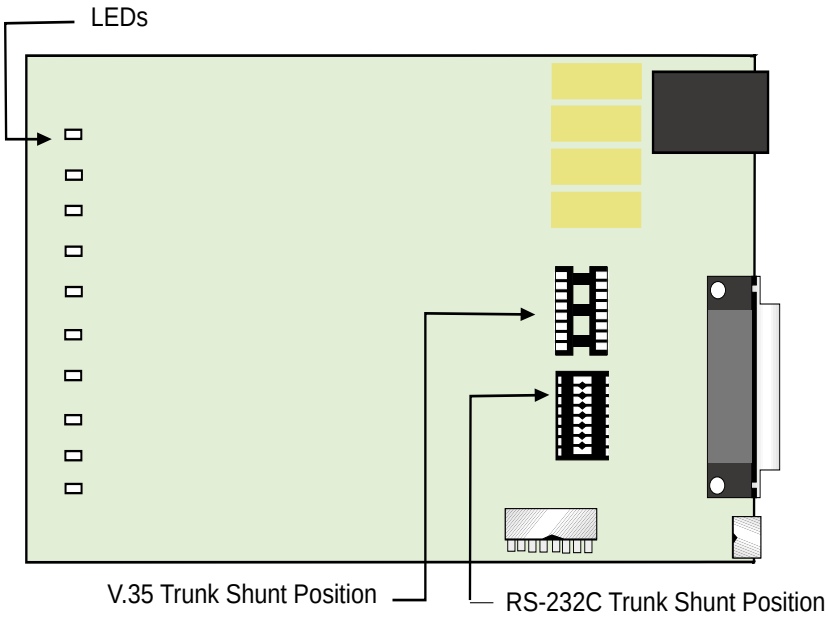



***Figure 1-4. Shunts***

The data port shunts are shown in the RS-232 (default) position in Figure 1-4. To change the position of a shunt, refer to the V.35 Shunt procedure in Chapter 2.

# Specifications

## Data Port

- Single data port with synchronous or asynchronous data format
- Async data rate from 300 Kbps up to 115.2 Kbps or sync data rate from 4.8 Kbps up to 128 Kbps (internal DCE clocking)
- RS-232C and ITU-T V.35 interface using an adapter cable
- Internal shunt plugs to configure RS-232C or ITU-T V.35 interface
- Async data format of 5,6,7, or 8 bits; 1, 1½, or 2 stop bits; odd, even, or no parity
- Sync data format is HDLC/SDLC; NRZ or NRZI encoding; mark or flag idle
- Data port connector is a DB-25 female

## Trunk

- Single trunk port with synchronous DDS or compatible data format
- Sync data rate of 56 Kbps
- DDS interface with an RJ-48 keyed jack
- Full duplex over LADS (Local Area data Set) or two-pair non-loaded metallic wire

## Electrical/Physical/Environmental

- Voltage - 115v AC, 50/60 Hz
- Power - 5 watts
- Dimensions - 4.3" W x 1" H x 5.6" L

  - 10.8 cm x 2.5 cm x 14.2 cm
- Weight - 8 oz (224 g)
- Temperature - 32° to 120° F (0° to 50° )
- Humidity - 20 - 90% non-condensing

## Frame Relay Compatibility

- Link management via Annex D (ANSI T1.617), Annex A (ITU-T Q.933) or LMI
- Supports one PVC with DLCI number from 16 to 1007
- Congestion management
- Throughput management via settable CIR and Be values

MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Chapter 2 - Installation

MultiTech® Systems

# Introduction

This chapter is organized in the way you will unpack and cable your MultiFRAD. The unpacking section describes the contents of the shipping box and shows how the MultiFRAD is packaged. The installation procedure describes each cable connection and shows where that cable is connected to the MultiFRAD. If the shunt on the data port needs to be moved to its V.35 position, this can not be done until after the MultiFRAD is configured.

# Unpacking Your MultiFRAD

The shipping box contains the MultiFRAD, external power supply, trunk RJ-48 phone cord, your Quick Start Guide, and two diskettes (i.e., the MultiFRAD 100-Series User Guide, and the MultiFRAD Software). Inspect the contents for signs of any shipping damage. If damage is observed, do not power up the unit; contact Multi-Tech's Technical Support for advice (refer to Chapter 5). If no damage is observed, place the MultiFRAD in its final location and refer to Cabling your MultiFRAD in the next section.

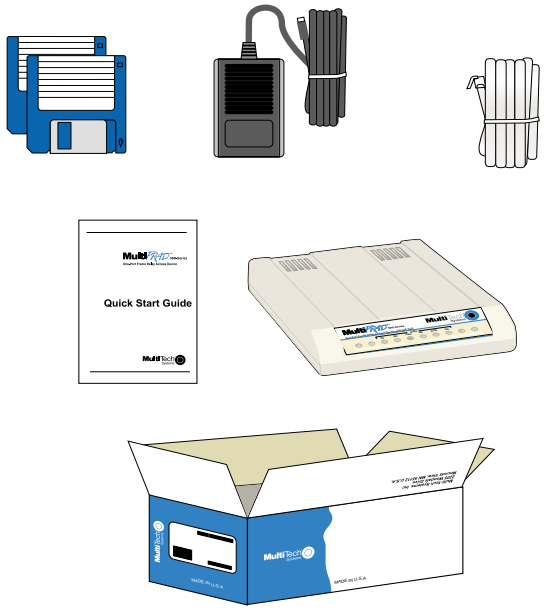



***Figure 2-1. Unpacking***

# Safety Warning Telecom

1. Never install telephone wiring during a lightning storm.
2. Never install a telephone jack in wet locations unless the jack is specifically designed for wet locations.
3. This product is to be used with UL and cUL listed computers.
4. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
5. Use caution when installing or modifying telephone lines.
6. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.
7. Do not use a telephone in the vicinity of a gas leak.
8. To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.

# Setting Up Your MultiFRAD

If V.35 electrical interface signaling is required on the data port but a PC with EIA-232D signaling is being used to configure the MultiFRAD, the unit has to be configured before you change to V.35 signaling. You need to set the DIP-switches, make the proper cable connections, configure the unit, and then change to V.35 signaling on the data port.

1. Ensure that the DIP switch settings on the side of the unit are set for a command mode of operation (i.e., Switch 1 is DOWN, Switches 2, 3 and 4 are UP).

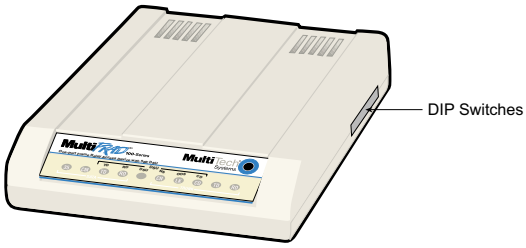



***Figure 2-2. Data/Command Switch***

| Switch | Mode | Position | Description |
|---|---|---|---|
| 1 | Cmd/Data | UP*<br>DOWN | Data<br>Command |
| 2 | Clocking | UP*<br>DOWN | DDS<br>Internal |
| 3 | Loopback | UP*<br>DOWN | Normal<br>Loopback |
| 4 | DSU | UP<br>DOWN* | FRAD<br>DSU |
| 5 | Force RTS | UP<br>DOWN* | Follows CTS<br>Forced active |
| 6 - 8 | Not Used | | |

* Factory default setting

2. Connect the external power transformer to the MultiFRAD and plug it into a live AC outlet. The MultiFRAD does not have a power switch. When power is applied to the unit, it takes about 10 seconds for it to power-up.

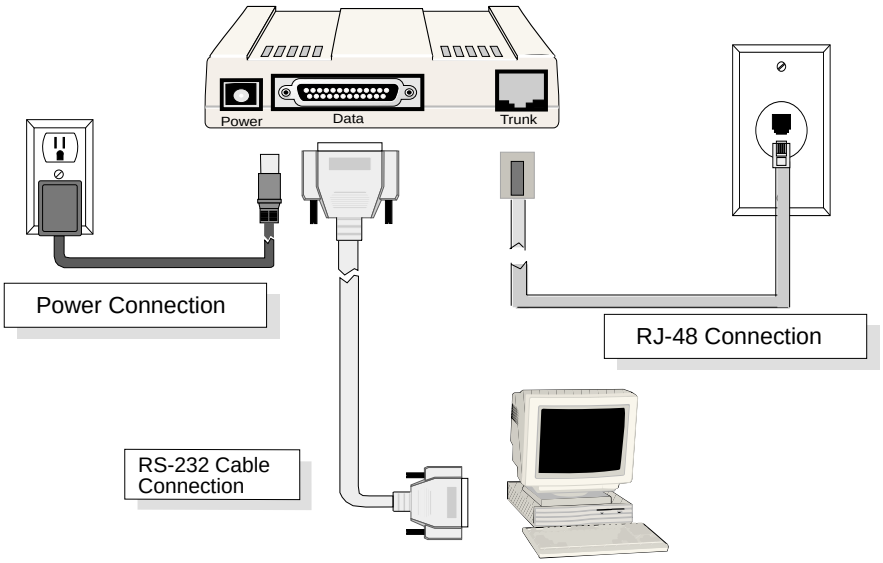



***Figure 2-3. Cable Connections***

3. Connect a PC running Windows to the **Data** connector on the back of the MultiFRAD. Use an appropriate RS-232 (DB-25) cable. Note that DIP switch 1 must be DOWN for command mode.
4. Connect an RJ-48 phone cable to the **Trunk** connector on the back of the MultiFRAD. Connect the other end of the phone cable to the local line jack.
5. Configure the unit in accordance with the Loading your Software procedure in Chapter 3.
6. Once the MultiFRAD is configured for your application, you can disconnect the PC and connect your data port device.

   If the data device has a V.35 interface, the data shunt must be moved from the default RS-232 position to the V.35 position and a V.35 adapter cable must be connected to the data port connector. Refer to the V.35 Shunt Procedure in the next section. Refer to Appendix A for cable details.
7. Place the Command Mode switch (Switch 1) in the UP position for the data mode operation.

At this time your MultiFRAD is completely cabled. Proceed to the Loading your Software procedure in this User Guide.

# V.35 Shunt Procedure

Either an EIA-232D or ITU-T V.35 electrical interface can be selected on the data port. Units are shipped with EIA-232D signal levels selected. Use the following procedure to select V.35.

**CAUTION**: This procedure requires opening the unit. Like most products of this type, this product contains components that are sensitive to static discharge. Please avoid static discharge when in contact with components.

1. Ensure that the external power supply is disconnected from the MultiFRAD.
2. The enclosure consists of two halves. Using a Phillips screwdriver, remove the two screws from the bottom of the unit (Figure 2-4). Remove the top half.

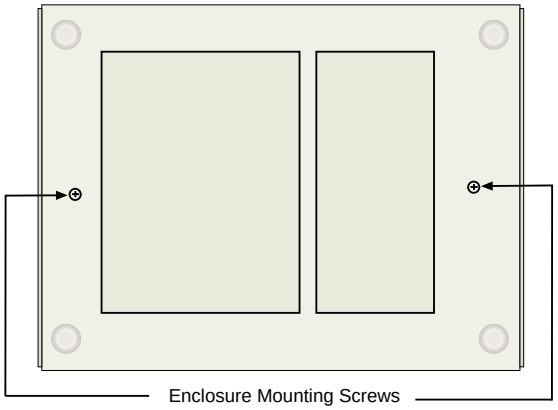



***Figure 2-4. Enclosure Mounting Screw Locations***

3. Pry the shunt (data or Trunk) out of its default RS-232 socket and insert it into the corresponding V.35 socket (Figure 2-5).

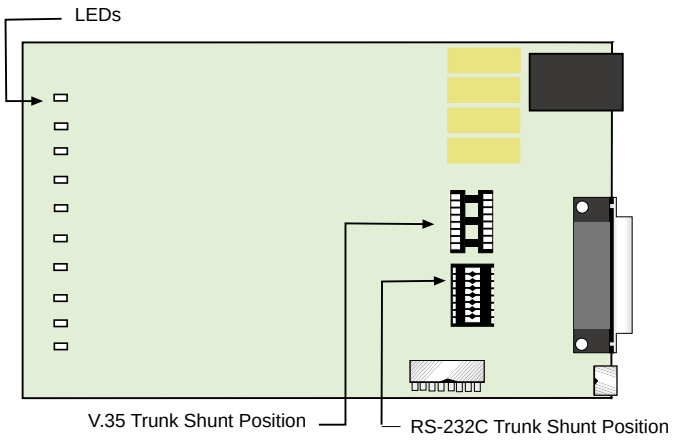



***Figure 2-5. Shunt Positions***

4. Carefully reassemble the unit making sure that no foreign objects are accidentally left inside.
5. The data port is now ready to be configured with V.35 signals. The cable pin designations are shown in Appendix A. To connect to a device equipped with a V.35 34-pin connector, you must obtain an adapter cable. Use the signal pin designation in Appendix A when making or ordering the adapter cable.

MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Chapter 3 - Software Loading and Configuration

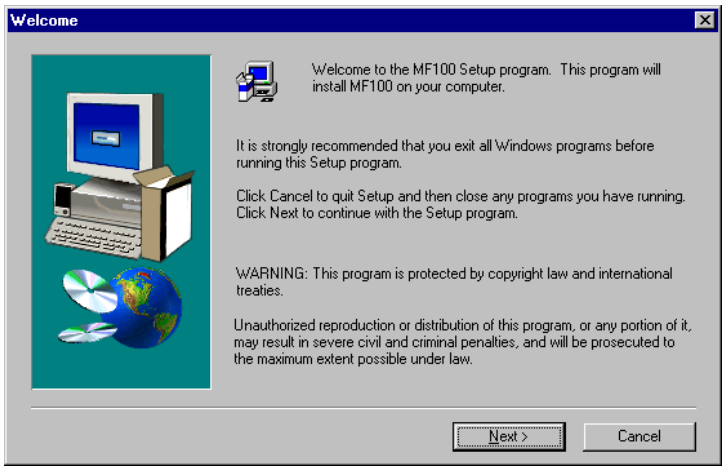
MultiTech® Systems

# Installing Your MultiFRAD Software

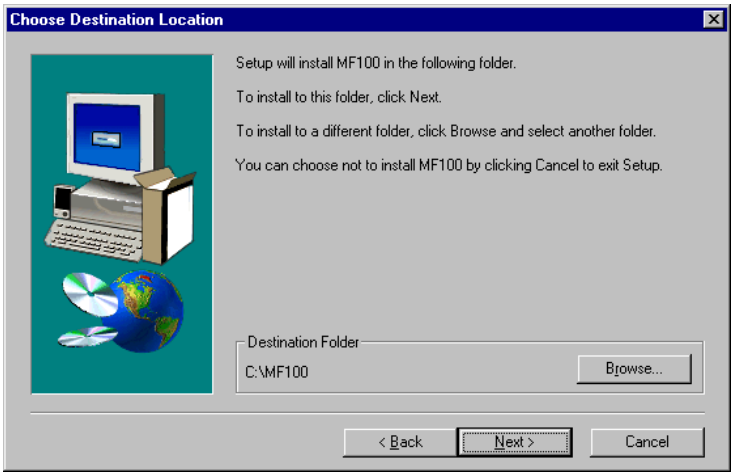
The following loading procedure does not provide every screen or option in the process of installing the MultiFRAD software. The assumption is that a technical person is doing the installation and that a thorough knowledge of Windows and the software loading process is understood. Additional information on the MultiFRAD software is provided in Chapter 4 of this User Guide.

1. Run Windows on the PC connected to the Command Port.
2. Insert the MultiFRAD software disk into the PC disk drive.
3. **Win98/95/NT users** - click **Start I Run**. In the Run dialog box click the down arrow and choose **a:\setup** or **b:\setup** (depending on the location of your floppy disk drive) or use the Browse button and click on Setup, then click **OK**.

   **Win3.1 users** - in the Program Manager, access Run by clicking **File I Run**. In the Run dialog box, type **a:\setup** or **b:\setup** (depending on the location of your floppy disk drive) in the Command Line field and then click **OK**.
4. Windows prepares the install shield and then the **Welcome** dialog box welcoming you to the MF100 Setup program screen is displayed.


Welcome
Welcome to the MF100 Setup program. This program will install MF100 on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
Next >
Cancel

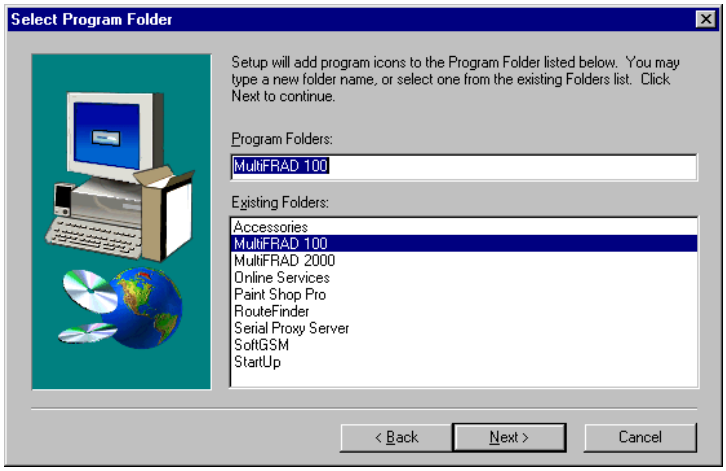
   Click **Next >** to continue.
5. The **Choose Destination Location** dialog box is displayed.


Choose Destination Location
Setup will install MF100 in the following folder.
To install to this folder, click Next.
To install to a different folder, click Browse and select another folder.
You can choose not to install MF100 by clicking Cancel to exit Setup.
Destination Folder
C:\MF100
Browse...
< Back
Next >
Cancel

   Follow the on-screen instructions to install your MultiFRAD software. You may choose the Destination Location of your MultiFRAD software or you can choose to select the default destination by clicking **Next >**.

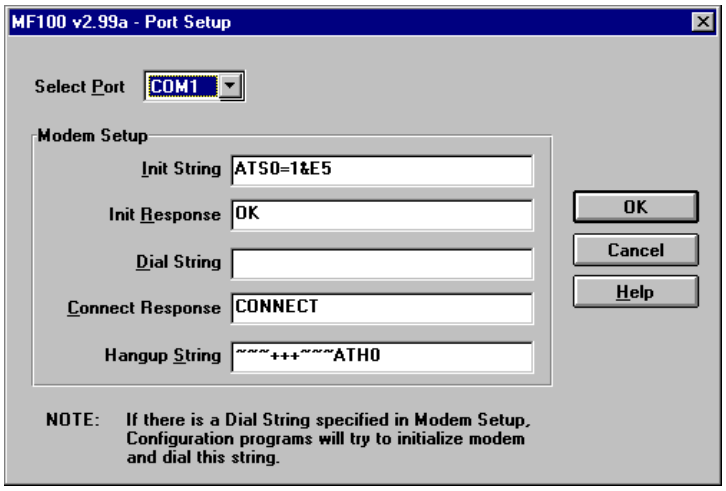
   **Note**: If you click on the **Browse** button you can choose from several folders. Multi-Tech Systems recommends that you choose the default destination.

6. The **Select Program Folder** dialog box is displayed.




Ensure that MultiFRAD 100 is highlighted and click **Next >**.

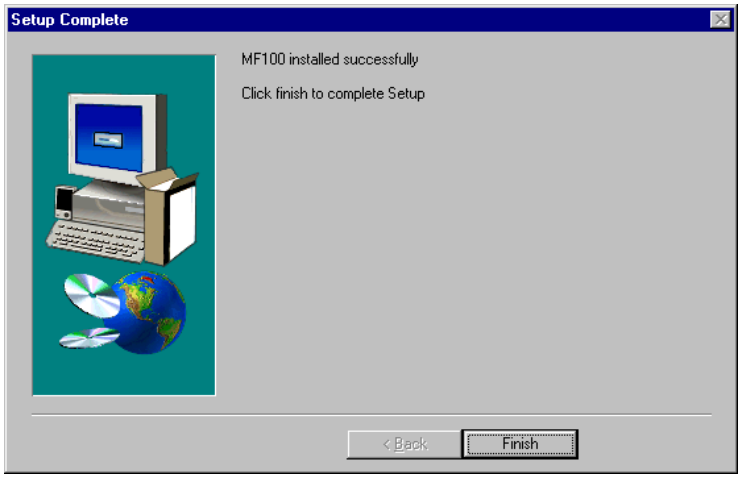
7. The **MultiFRAD - 100 Series** dialog box is displayed.




Ensure that the correct COM port (connected to the Command port on the MultiFRAD) is selected. If not, from the **Select Port** window, click on the down arrow and choose the COM port of your PC.

Click **OK** to continue.

8. The **Setup Complete** dialog box is displayed.

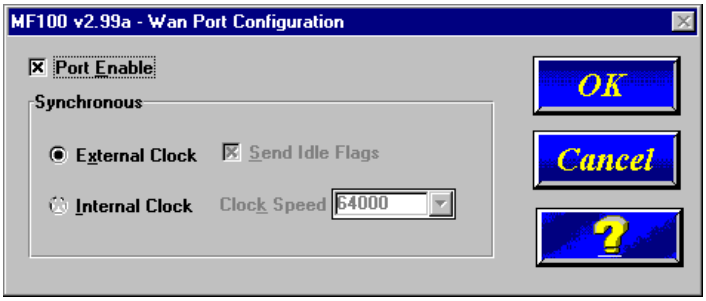



Click **Finish** to continue.

9. The **MultiFRAD 100 Series** dialog box is displayed asking “Do you want to download default setup?”

Click **Yes** to continue.

10. The **WAN Port Configuration** dialog box is displayed.

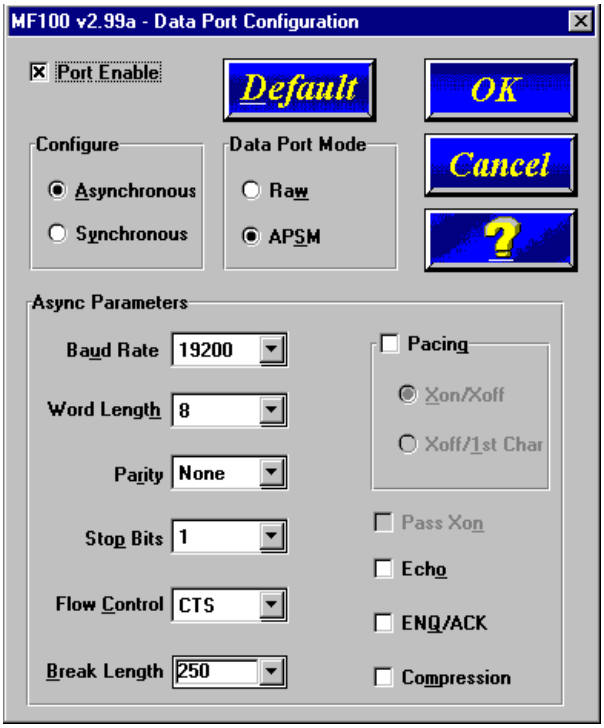



Ensure that the WAN Port is enabled and the External Clock option is active.

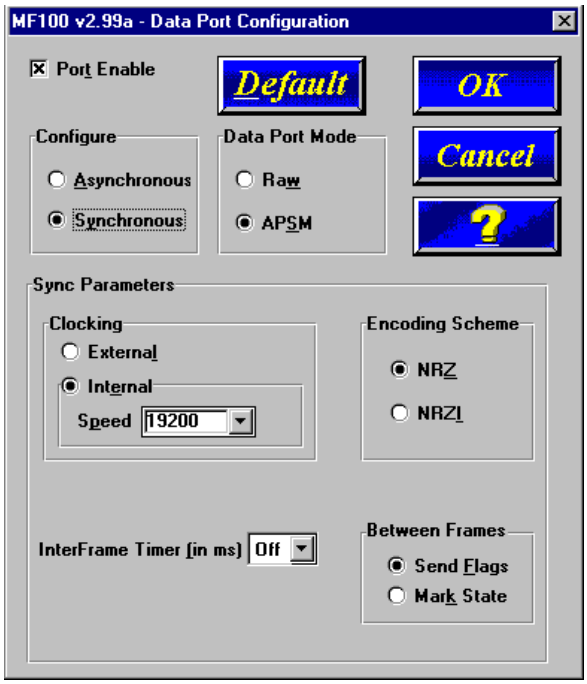
Click **OK** when you are finished.

11. The **Data Port Configuration** dialog box is displayed allowing you to configure the data channel for either asynchronous or synchronous mode of operation.

If your data device is an **Asynchronous** device, then the default Asynchronous Configure group is OK, choose the Data Port mode (Raw or APSM), and then set the baud rate by clicking the Baud Rate down arrow and choosing the baud rate from the drop down list. Also, select the Word Length, Parity, Stop Bits, etc. for your device. Refer to the user documentation for the parameters of the data device.



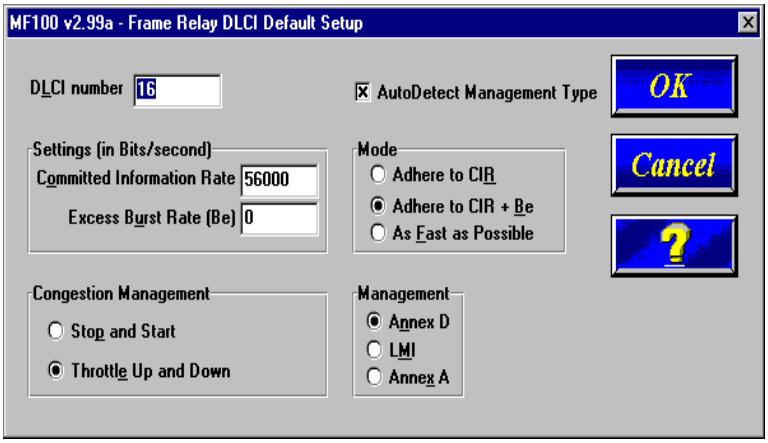
If your data device is a **synchronous** device, then click the Synchronous option and the Sync Parameters are displayed. Ensure that the clocking and, if an internal clock is used, the Speed is correct. Also, check the Encoding Scheme, Between Frames, and InterFrame Timer are correct for your data device. Refer to user documentation for the parameters of the data device.




When you have completed your data port configurations, click **OK**.

12. The **Frame Relay DLCI Default Setup** dialog box is displayed.

    Your MultiFRAD can detect the DLCI and the frame relay management type when the unit is connected to an active frame relay network service. At this point your MultiFRAD is not communicating with the frame relay network. But if you know your DLCI and want to add it at this point, you can continue with the next step. If you wish to wait until your MultiFRAD is communicating with the frame relay network, proceed to step 13 to finish installing your software.

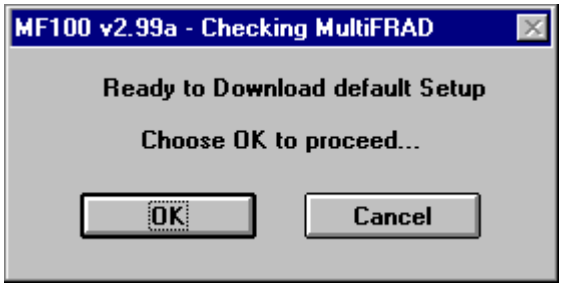



- Click on the **DLCI number** field to change the default DLCI to the number provided by your service provider at subscription time.
- Click on the **Committed Information Rate** numeric box in the **Settings** (in Bits/second) category and enter the CIR value provided by your service provider at subscription time for this DLCI.
- Click on the **Excess Burst Rate (Be)** numeric box in the **Settings** (in Bits/second) category and enter the Be value provided by your service provider at subscription time for this DLCI.

- Ensure that **Adhere to CIR + Be** check box in the throughput **Mode** category is selected. Multi-Tech recommends this setting initially.
- Ensure that **Throttle Up and Down** in the **Congestion Management** category is selected.
- Click on the **Management** type supported by the Frame Relay network. The network management type is supplied by your service provider at subscription time.

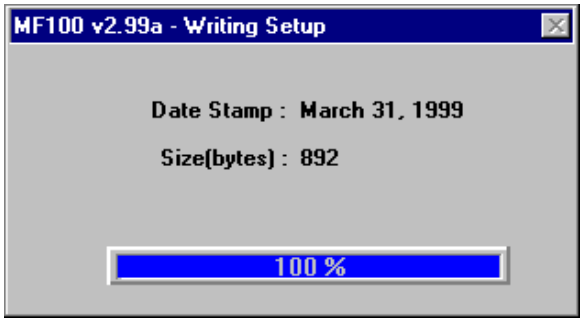
When you have completed your Frame Relay DLCI setup, click **OK**.

13. The **Checking MultiFRAD** dialog box is displayed.

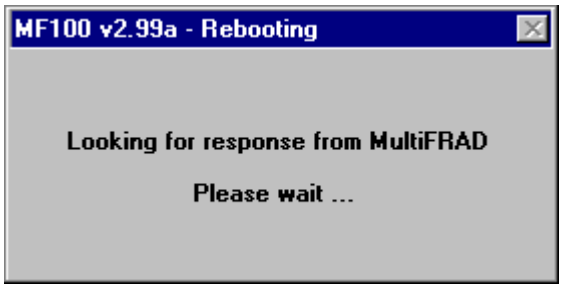



Click **OK** to start the download process.

14. The **Writing Setup** screen is displayed as the configuration is written to the MultiFRAD. This will take a few seconds.




15. After the setup is written to the MultiFRAD, the **Rebooting** screen is displayed. The software will wait until the unit has fully rebooted.




16. **Win98/95/NT users** - you are returned to your MultiFRAD 111A folder which will be visible on your desktop.

**Win3.1 users** - you are returned to your Program Manager where the MultiFRAD Program Group and Program Item (Windows icons) have been created.

Your MultiFRAD is operational at this time.

MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Chapter 4 - MultiFRAD Software

MultiTech® Systems

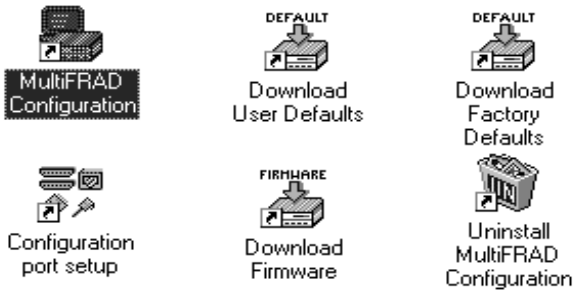
# Introduction

This chapter describes the MultiFRAD software from an applications standpoint, showing how to make changes in the configuration with recommendations on the impact of any such changes. The major configuration parameters were set when the software was loaded into your PC and the setup configuration was downloaded to the MultiFRAD at the conclusion of the software installation. The MultiFRAD software is designed for the Microsoft Windows™ environment.

Recommendations are provided to explain that changing parameters may affect your unit in a certain way. Our intent is not to cover every dialog box nor every field within a dialog box. The on-line help provided with your software provides such definitions, along with explanations of parameters and defaults where applicable. This constitutes a dynamic help system in that the information presented always relates to the dialog box or window that is currently open.

# Before You Begin

Your MultiFRAD program group contains several applications which provide the maximum flexibility for configuration and use. These utilities are accessible in Windows98/95/NT by clicking **Start | Programs | MultiFRAD 100 | *(utility)***. The various options include Configuration Port Setup, Download Factory Defaults, Download User Defaults, MultiFRAD Configuration, Download Firmware, and Uninstall MultiFRAD Configuration.




MultiFRAD Configuration will be discussed in detail later in this chapter. A brief description of the other components is provided here:

## Download User Defaults

This feature allows you to download the user default settings, configured during installation (or after downloading new settings through MultiFRAD configuration), to the MultiFRAD. If you have made changes to the MultiFRAD Configuration and wish to revert to the default setup, you can do so through the MultiFRAD 100 program group.

## Download Factory Defaults

Choose **Download Factory Defaults** to download the factory default settings. If the MultiFRAD is running, you will be queried to reboot. Click **Yes** to continue with the download. You will then be presented with two dialogs including **IP Setup** and **Data Channel Setup**. These screens will contain the original setup information. Click **OK** on each to accept the default settings, or make any necessary changes and then click **OK**. When prompted, click **OK** again to proceed with the download. The default setup will be written to the MultiFRAD. This process may take a few minutes. When it is finished, you will be returned to Windows.

## Configuration Port Setup

The Configuration Port Setup utility allows you to set up and configure the command port on your MultiFRAD. This dialog is included in the initial installation process. Although parameters can be changed, be sure to note the current status of the software before making any alterations.

When you installed the MultiFRAD software, you selected which COM port to use with the configuration port setup. You can assign another COM Port and define the modem Init String, Dial String, and various other responses. For more information on each individual parameter, refer to the on-line Help provided with the software.

## Download Firmware

This utility allows you to download the firmware to the MultiFRAD. This may be necessary in the case of repair or upgrade. To download the firmware, choose **Download Firmware** from the MultiFRAD program group, and the **Open** dialog box is displayed (if the MultiFRAD is running, you will be queried to reboot to update firmware; click **OK** to proceed and the **Open** dialog will be displayed).

By default, the software will display the proper firmware from the MultiFRAD folder. Double click this file in the **File Name** list.

The **Downloading Code** dialog is displayed, which includes a status bar to monitor the download. When the download is complete the MultiFRAD will reboot. This process will take several minutes. After rebooting, you will be returned to Windows.

## Uninstall MultiFRAD Configuration

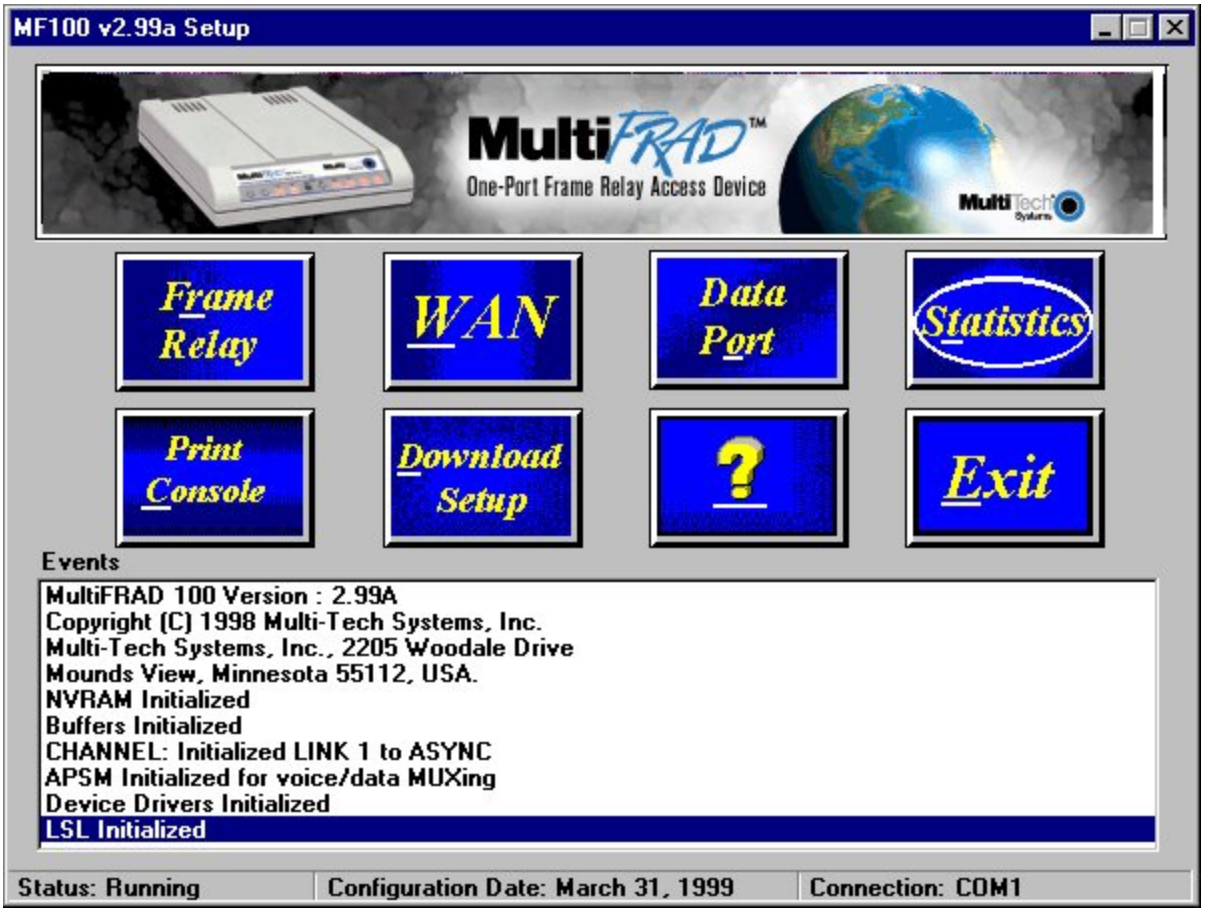
Selecting Uninstall MultiFRAD Configuration will allow you to completely remove all the components of the MultiFRAD program group. Upon selecting this option you will be queried for confirmation. Click **Yes** to continue with the uninstall, or click **No** to abort.

# MultiFRAD Configuration

The MultiFRAD Setup menu consists of eight buttons on which you can point and click, an Events window in the middle of the menu, and a status bar at the bottom of the menu. The eight buttons allow you to display and change the Frame Relay parameters, WAN port setup, Data Ports configuration, and display Statistics.

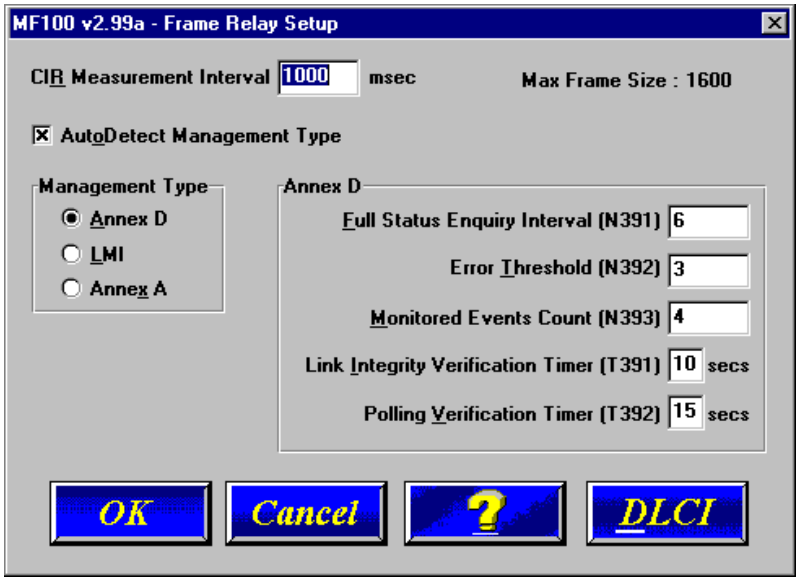
The Events window, in the center of the window, is a smaller version of the print console. It can be a useful tool when troubleshooting. Its purpose is to provide information about the boot process and ongoing information regarding the status of “events” such as the Channel Initialized, etc.

The status bar at the bottom of the Setup menu displays the status of the unit (e.g., Running), the date that the unit was last configured, and the connection on the command port (e.g., COM 1).



# Frame Relay Setup

The **Frame Relay Setup** dialog box displays the CIR Measurement Interval in milliseconds, the Management Type, and details of that management type. The MultiFRAD can detect the DLCI and the Management Type at power-up if you are connected to an active frame relay service. If you change any frame relay parameters, it is important that the new parameters agree with the way your frame relay service is provisioned.




In this dialog box, you can change the Management Type by choosing one of the three options and then the detail parameters for that option are displayed to the right of the Management Type. For example, in the above dialog box, Annex D is the chosen management type with the Full Status Enquiry Interval [N391] set to 6 down through Polling Verification Timer [T392] set to 15.

Usually, you will have no need to change the management type because the MultiFRAD will automatically detect the network's management type at power-up, or when the network becomes active. This auto-detection feature takes about 1 to 2 minutes to detect the management type and list the DLCI.

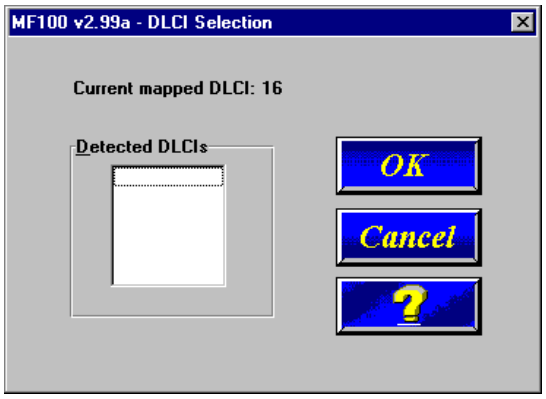
Occasionally the Management Type parameters can be changed to correct a problem. In these cases, making the following changes could alleviate the problem:

1. Change the **Link Integrity Verification Timer**. This feature sets how often the MultiFRAD verifies that the link is good. Changing the setting from the default value of 10 seconds, to a lower value, i.e., 5 seconds, will increase the frequency of those verifications.
2. Change the **Full Status Enquiry Interval** to affect how often DCLI Status is updated. This parameter defines how often the MultiFRAD will send a request for DLCI status information along with the Link Integrity Verification request. The default value is to include such a request every sixth time the link integrity is checked. A value less than every sixth request will allow faster detection of active/inactive DLCIs, but will also produce a slight increase in management overhead.
3. Change the **Monitored Events Count** and the **Error Threshold** to affect the MultiFRAD's sensitivity to errors on the link. Every management frame received by the MultiFRAD is considered an event, and if the link integrity sequence numbers are wrong, for example, it is considered an "errored" event. With the default settings (**Error Threshold** is 3 and **Monitored Events Count** is 4), and 3 out of 4 events are "errored", then the link is considered to be bad, and the FRAD stops sending on the DLCI and restarts the initial procedures to activate the link.
4. Change the **CIR Measurement Interval** to change the time frame in which the FRAD calculates throughput for the DLCI. By default, every 1000 milliseconds (1 second), the MultiFRAD

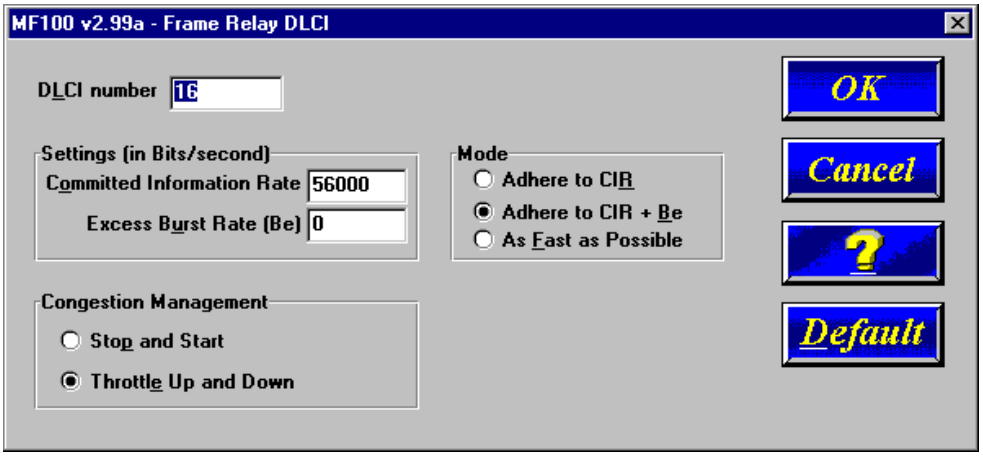
calculates how much information has been sent on the DLCI, and depending on the congestion management option for a DLCI, the MultiFRAD may stop sending on that DLCI because it has exceeded its CIR or CIR+Be rating. By changing the CIR Measurement interval, the throughput calculations can be made more or less often.

**Note:** performance could be compromised if the MultiFRAD is set to calculate throughput too often.

If you click the DLCI button on the right side of the dialog box, the Frame Relay **DLCI Selection** dialog box is displayed.




This dialog box shows the currently mapped DLCI as well as any DLCIs that the FR111A has detected on the link with the frame relay switch. Click OK to continue or highlight a selected DLCI and then click OK to change the mapped DLCI to the highlighted DLCI. The next screen is the Frame Relay DLCI screen and it shows the current DLCI. It also shows the settings (in Bits/second) for the Committed Information Rate and the Excess Burst Rate (Be), throughput mode, and your Congestion Management.




To change the DLCI Number, enter the number in the Enter DLCI Number window. You do not have to enter the leading zeros.

Congestion Management, throughput Mode, and CIR/Be settings are used to avoid congestion and possible loss of data. The Committed Information Rate (CIR) and Excess Burst rate (Be) settings are throughput values determined by the network and user when a DLCI is ordered. The CIR is the basic throughput which the network will try to set aside for that DLCI. It will always be equal to or less than the actual access rate of the physical line (i.e., if the frame relay physical link is a 56K DDS line, the sum of the CIRs of all DLCIs on that link should not exceed 56 Kbps). The Be is the excess burst throughput rate (added to CIR) that the network should accept for that DLCI before significant loss of data occurs due to the discarding of frames during times of congestion. Note, however, that in frame relay there is no absolute guarantee of a congestion-free link, regardless of CIR and Be settings. The CIR and Be settings on the MultiFRAD should match the settings that the network has provisioned.

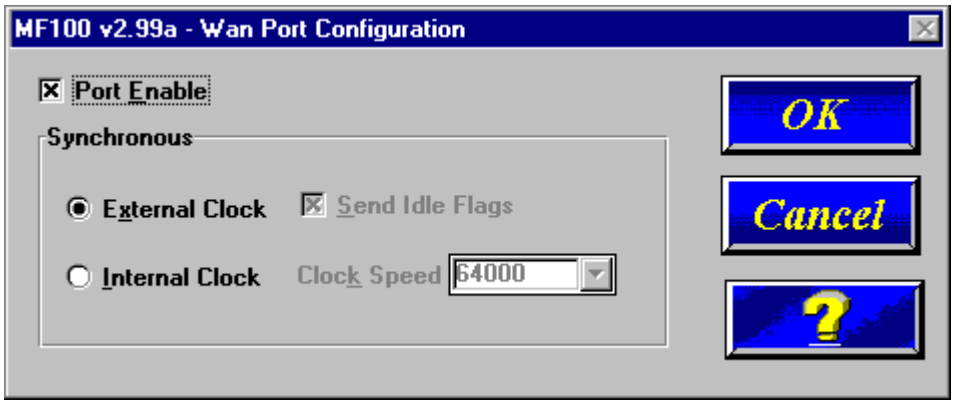
The Congestion Management and throughput Mode settings determine how the MultiFRAD handles congestion.

The throughput Mode selects whether the MultiFRAD should use its own throughput calculations to avoid congestion, or simply send data to the network as fast as possible. The MultiFRAD calculates throughput after every CIR Measurement Interval, and can limit throughput to either the CIR (Adhere to CIR) or the CIR plus the Be (Adhere to CIR+Be). The Congestion Management setting selects whether the MultiFRAD should stop sending data when congestion is indicated (Stop and Start), or gradually reduce throughput during times of congestion (Throttle Up and Down).

# WAN Port Setup

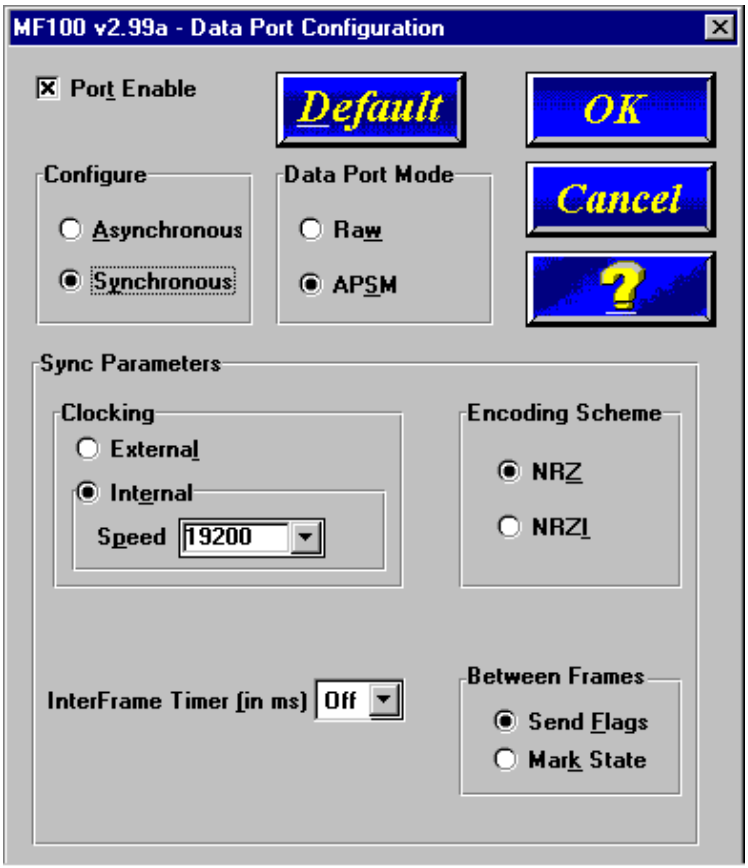
The WAN Port Setup dialog box controls how the synchronous port is configured. If the WAN port is configured for External Clock, then the clocking is provided by the DCE device. If Internal Clock is configured, then click the down arrow and choose the clock speed. Normally, External Clock is selected.

**Note**: Must always be external clock.



# Data Port Configuration

The **Data Port Configuration** dialog box allows you to change the parameters of the data port to match those of the data device. The MultiFRAD data port can operate in either synchronous or asynchronous mode. If your data device is an asynchronous device, choose the Configure Asynchronous option and configure the MultiFRAD to match your device. If the data device is a synchronous device, choose the Configure Synchronous option and configure the MultiFRAD to match your synchronous device.




For example, the data port could be connected to a Multi-Tech MultiMux MMH904. In this situation, the data port could be configured with the following options:

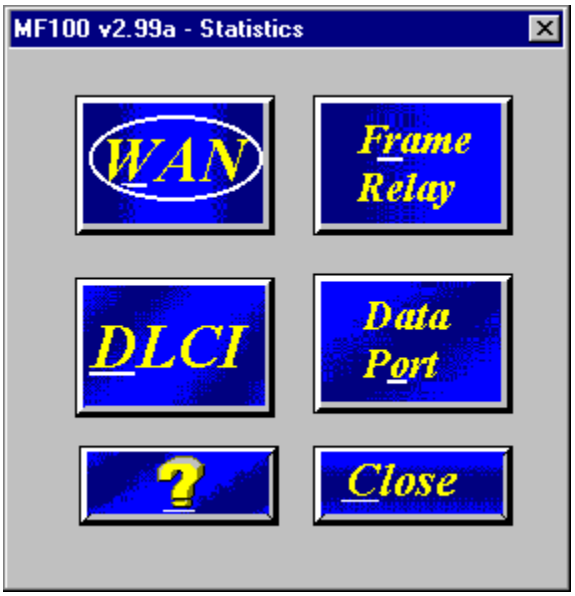
- Data Port Mode set to Raw,
- Synchronous Configuration,
- Internal Clocking with Speed set to 19200,
- Encoding Scheme set to NRZ (for all Multi-Tech Muxes),
- Between Frames set to Send Flags, and
- InterFrame Timer (in ms) has to be off.

The MMH904 would have to be configured for an external composite link device. This means that dip position 2 on the 8-position DIP Switch on the MMH904 would have to be toggled to the closed position and an external composite link cable connected between the MMH904 and the MultiFRAD Data connector.

In most applications, the Encoding Scheme, Interframe Timer, and Between Frames will be used at their default settings. If you are unsure of your device's configuration, start with the defaults or refer to your device's documentation.

# Viewing Statistics

The **Statistics** dialog box allows you to view statistics on the major events of the MultiFRAD operation. This dialog box is accessed by clicking the Statistics button on the Main MultiFRAD menu.

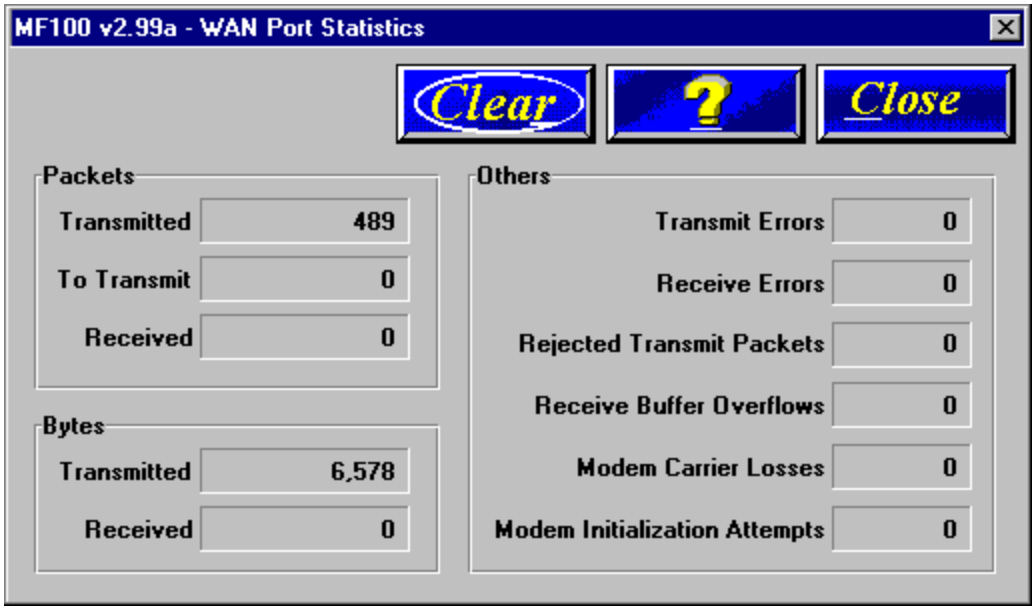



Statistics can be a helpful troubleshooting tool. For example, viewing the WAN Statistics you can see if the MultiFRAD is sending or receiving on the WAN port. When the MultiFRAD is connected to a frame relay network, it will transmit management frames approximately every ten seconds, trying to establish communication with the provider's switch. If the unit is sending frames but not receiving any, this may be an indication of a problem with the link device or the frame relay network. Statistics in the frame relay dialog box actually show the number of management frames being sent and received, and can also indicate a link or frame relay network problem.

Another helpful statistic screen is DLCI. It reflects the status of the PVC, i.e., active or inactive and whether or not the MultiFRAD is experiencing network congestion (reflected by FECNs or BECNs received).

## WAN Port Statistics

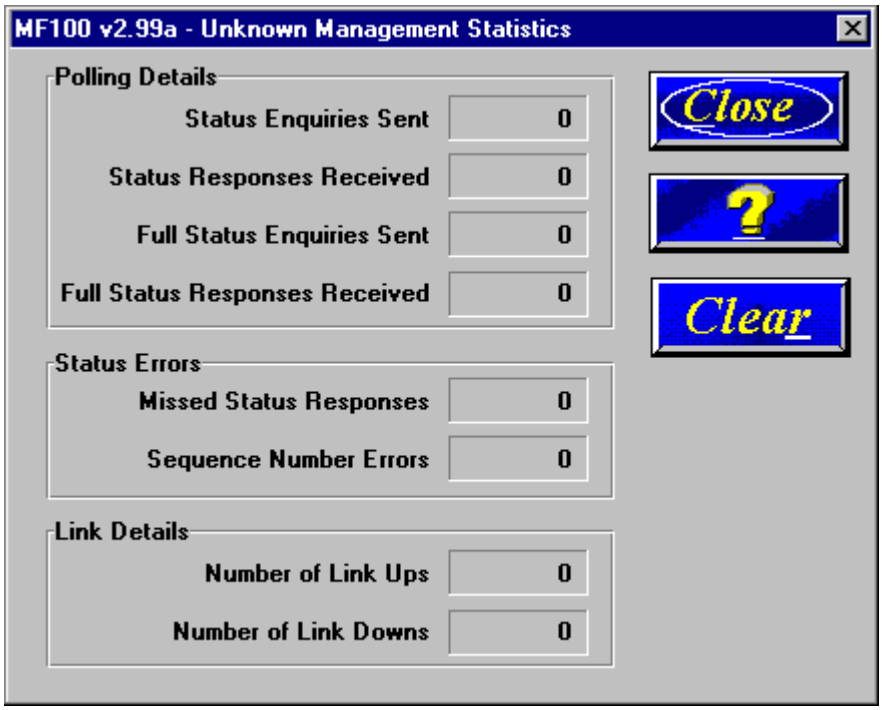
The **WAN Port Statistics** dialog box provides statistical information regarding the MultiFRAD's WAN port, including the number of packets transmitted/received, and total bytes transmitted/received.




The WAN Port Statistics dialog box pertains to the traffic on the MultiFRAD's WAN port. The Statistics that fall into "Others" category relate to the physical layer between the MultiFRAD and the link device, i.e. the CSU/DSU. These statistics can be helpful in troubleshooting suspected problems at the physical layer, i.e., the WAN port itself, the link device (CSU/DSU), and any associated cabling.

## Frame Relay Statistics

The Frame Relay **Management Statistics** dialog box can be a useful tool for troubleshooting MultiFRAD installations and monitoring the performance of the link, and determining if the MultiFRAD is talking to the provider's switch.




The **Polling Details** section lists the various management frames sent and received. For every Status Enquiry Sent, a Status Response should be received from the network. Likewise, for every Full Status Enquiry Sent, there should be one Full Status Response received. The two status enquiry types are used by the FRAD to verify that the frame relay network is operational, and to determine the active DLCI. Under default settings a status enquiry is sent every ten seconds, and every sixth enquiry will be a Full Status Enquiry.

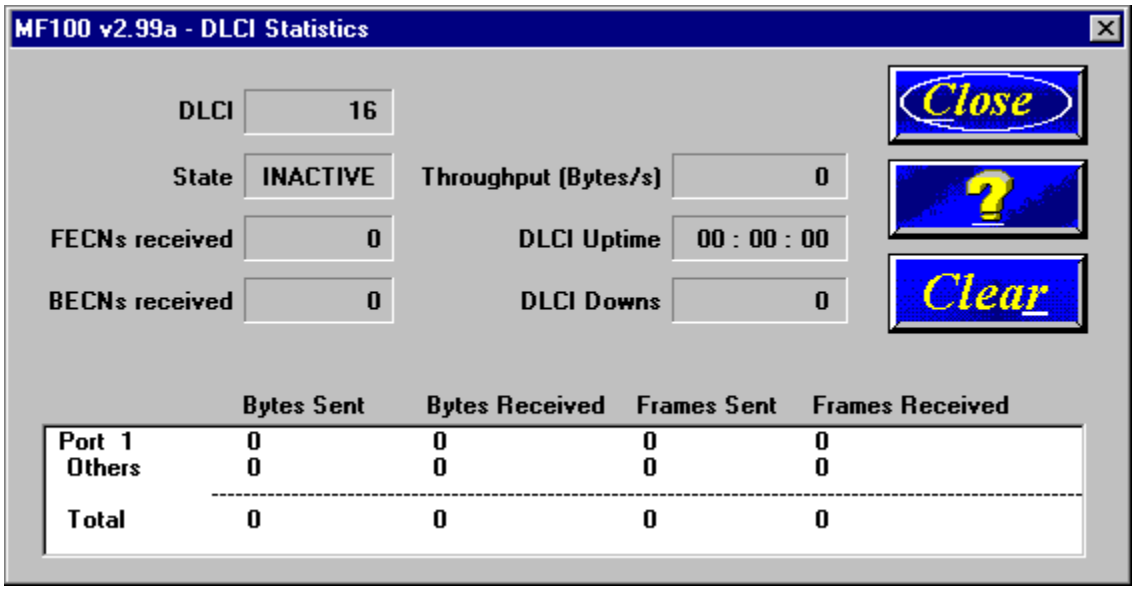
The Enquiries Sent and the Responses Received should increment together, and should be equal under normal circumstances. Any gap between them reflects a breakdown in communication with the provider's switch, and will be reflected as Missed Status Responses.

The **Status Errors** section lists the number of errors that have occurred. A Missed Status Response means that the frame relay network did not respond to a status enquiry from the MultiFRAD before the next status enquiry was sent (by default there are 10 seconds between status enquiries).

A **Sequence Error** means that the sequence numbers in a received status response do not match what the MultiFRAD expected based on its Status Enquiry. Basically, the Status Enquiry has two numbers (or counts) - one should be incremented by the FRAD and the other should be incremented by the network. Both numbers should be returned to the FRAD in the Status Response. Sequence Number Errors also reflect missing packets between the MultiFRAD and the switch, but should not be a cause for alarm unless they are incrementing rapidly and steadily.

The **Link Details** section records the number of times the frame relay link between the MultiFRAD and the network has gone up (become active) or gone down (become inactive). The Link Details provide a more general picture of the status of communication between the MultiFRAD and the frame relay network.

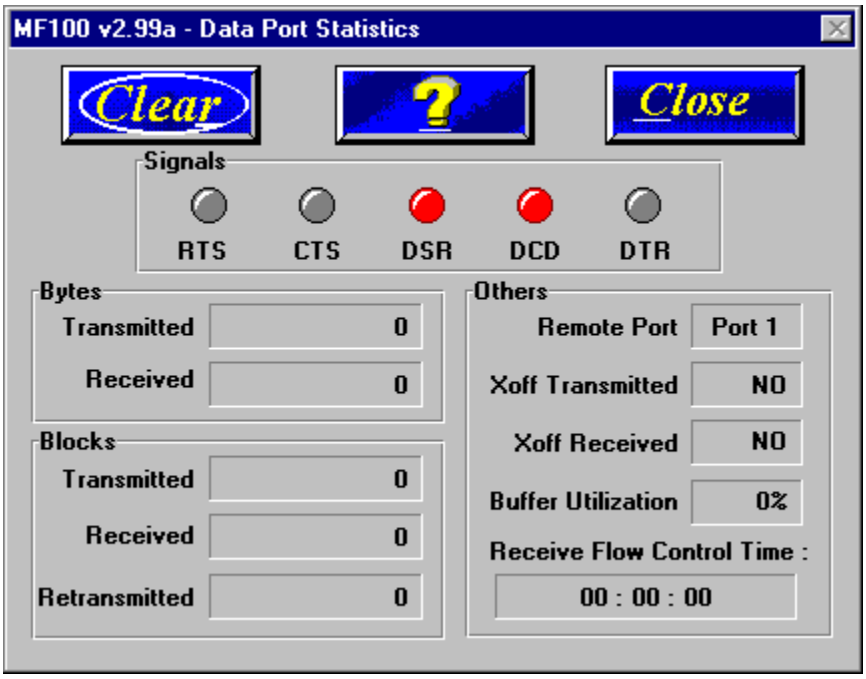
The **DLCI Statistics** dialog box shows the individual DLCI status and statistics. This information can be helpful in determining if the DLCI is active, if it is going up and down, and if the MultiFRAD is experiencing frame relay network congestion (FECN/BECN). It also gives an indication of the momentary throughput on the DLCI.




When trying to troubleshoot a frame relay circuit, once it has been established that management frames are being sent and received, the next step is to determine whether the DLCI has become active. This dialog box will give that information. A FRAD needs to be present at both ends for the DLCI to be active. Keep in mind that the frame relay network tells the FRAD the status of the PVC with one of its status responses. But the network will not say the PVC is active until it has established management communication at both ends of the PVC. If the FRADs at both ends of the PVC show that they are communicating with the frame relay network and the DLCI at both ends shows active, but there is still a communication problem over that PVC, then there may be a problem with your service provider.

## Data Port Statistics

The **Data Port Statistics** dialog box displays statistical information, such as bytes or blocks received/transmitted, for the data port.




This window shows the statistics for the data channel. You can view the channel statistics, as well as various hardware signals (CTS, RTS, DSR, DCD, DTR) and XON/XOFF (flow control) status. It also gives an indication of buffer utilization and receive flow control time.

These may be indicators that either the data channel, or more likely the device attached to it, are being utilized more than the capacity of the DLCI or the frame relay network allows. Excessive buffer utilization and/or receive flow control time can usually be reduced or eliminated by slowing the speed at which the channel is operating.

MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Chapter 5 - Warranty, Service and Tech Support

MultiTech® Systems

# Introduction

This chapter starts out with statements about your MultiFRAD 2-year warranty. The next section, Tech Support, should be read carefully if you have questions or problems with your MultiFRAD. It includes the technical support telephone numbers, space for recording your product information, and an explanation of how to send in your MultiFRAD should you require service. The final three sections explain how to use our bulletin board service (BBS), and get support through CompuServe and the Internet.

# Limited Warranty

Multi-Tech Systems, Inc. (“MTS”) warrants that its products will be free from defects in material or workmanship for a period of two years from the date of purchase, or if proof of purchase is not provided, two years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS’s written authorization, or used in any manner inconsistent with MTS’s instructions.

MTS’s entire obligation under this warranty shall be limited (at MTS’s option) to repair or replacement of any products which prove to be defective within the warranty period, or, at MTS’s option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS’s factory transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

## On-line Warranty Registration

To register your MultiFRAD on-line, click the following link:

**http://www.multitech.com/register**

*MOUNDS VIEW, MINNESOTA 55112*
*ATTN: SERVICE OR REPAIRS*

You should also check with the supplier of your MultiFRAD on the availability of local service and/or loaner units in your part of the country.

# Tech Support

Multi-Tech has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, call 1-800-972-2439. Please fill out the MultiFRAD information (below), and have it available when you call. If your MultiFRAD requires service, the tech support specialist will guide you on how to send in your MultiFRAD (refer to the next section).

## Recording MultiFRAD Information

Please fill in the following information on your Multi-Tech MultiFRAD. This will help tech support in answering your questions. (The same information is requested on the Warranty Registration Card.)

Model No.: _____
Serial No.: _____
Software Version: _____

The model and serial numbers are on the bottom of your MultiFRAD.

Please note status of your MultiFRAD including LED indicators, screen messages, problems with a specific application, etc. Use the space below to note the MultiFRAD status:

_____

_____

_____

_____

_____

_____

# Service

If your tech support specialist decides that service is required, your MultiFRAD may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems.

Include the following with your MultiFRAD:

- a description of the problem.
- return billing and return shipping addresses.
- contact name and phone number.
- check or purchase order number for payment if the MultiFRAD is out of warranty. (Check with your technical support specialist for the standard repair charge for your MultiFRAD).
- if possible, note the name of the technical support specialist with whom you spoke.

If you need to inquire about the status of the returned product, be prepared to provide the **serial number** of the product sent.

Send your MultiFRAD to this address:

*MULTI-TECH SYSTEMS, INC.*
*2205 WOODALE DRIVE*
*MOUNDS VIEW, MINNESOTA 55112*
*ATTN; SERVICE OR REPAIRS*

# The Multi-Tech BBS

For customers who do not have Internet access, Multi-Tech maintains a bulletin board system (BBS). Information available from the BBS includes new product information, product upgrade files, and problem-solving tips. The phone number for the Multi-Tech BBS is (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).

The BBS can be accessed by any asynchronous modem operating at 1200 bps to 56 Kbps at a setting of 8 bits, no parity, and 1 stop bit (8-N-1).

## To Log on to the Multi-Tech BBS

1. Set your communications program to **8-N-1**.
2. Dial our BBS at (800) 392-2432 (USA and Canada) or (612) 785-3702 (international and local).
3. At the prompts, type your first name, last name, and password; then press ENTER. If you are a first time caller, the BBS asks if your name is spelled correctly. If you answer yes, a questionnaire appears. You must complete the questionnaire to use the BBS on your first call.
4. Press ENTER until the Main Menu appears. From the Main Menu you have access to two areas: the Files Menu and News. For help on menu commands, type **?**.

## To Download a File

**If you know the file name**

1. From the Main Menu, type **F** to access the Files Menu, then type **D**.
2. Enter the name of the file you wish to download from the BBS.
3. If a password is required, enter the password.
4. Answer **Y** or **N** to the automatic logoff question.
5. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
6. If you select Zmodem, the transfer will begin automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
7. When the download is complete, press ENTER to return to the File Menu.
8. To exit the BBS, type **G** and press ENTER.

**If you don’t know the file name**

1. From the Main Menu, type **F** to access the Files Menu. For a list of file areas, type **L**, press ENTER, then type **L** and press ENTER again. (If you do not type the second *L*, you will list all of the files on the BBS.)
2. Mark each file area you would like to examine by typing its list number and pressing ENTER.
3. Enter **L** to list all the files in the selected file areas. Enter **C** to go forward in the file list and **P** to go back.
4. To mark one or more files for download, type **M**, press ENTER, type the list numbers of the files, and press ENTER again.
5. Enter **D**. You will see a list of the files you have marked. Enter **E** if you would like to edit the list; otherwise enter **D** again to start the download process.

6. Select a file transfer protocol by typing the indicated letter, such as **Z** for Zmodem (the recommended protocol).
7. If you select Zmodem, the file will transfer automatically. If you select another protocol, you may have to initiate the transfer yourself. (In most data communications programs, the PAGE DOWN key initiates the download.)
8. When the download is complete, press ENTER to return to the File Menu.
9. To exit the BBS, type **G** and press ENTER.

# About the Internet

Multi-Tech is a commercial user on the Internet, and we retrieve messages from our customers on a periodic basis. If you prefer to receive technical support via the Internet, you can contact Tech Support at the following address:

**http://www.multitech.com/_forms/email_tech_support.htm**

Multi-Tech's presence includes a Web site at:

**http://www.multitech.com**

and an ftp site at:

**ftp://ftp.multitech.com**

# About Ordering Accessories

SupplyNet, Inc. can supply you with replacement transformers, cables and connectors for select Multi-Tech products. You can place an order with SupplyNet via mail, phone, fax or the Internet at:

**Mail:** SupplyNet, Inc.
614 Corporate Way
Valley Cottage, NY 10989

**Phone:** 800 826-0279

**Fax:** 914 267-2420

**Email:** info@thesupplynet.com

**Internet:** http://www.thesupplynet.com

**SupplyNet Online Ordering Instructions**

1. Browse to http://www.thesupplynet.com. In the **Browse by Manufacturer** drop-down list, select **Multi-Tech** and click

2. To order, type in quantity, and click

3. Click

to change your order
4. After you have selected all items, click

to finalize the order. SupplyNet uses Verisign's Secure Socket Layer (SSL) technology to ensure your complete shopping security.

MultiFRAD™ 100-Series

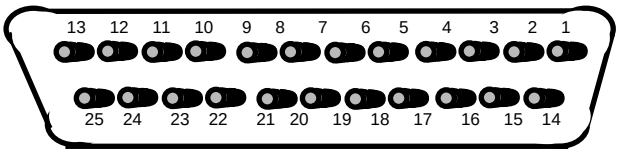
One-Port Frame Relay Access Device with 56K DSU

# Appendices

MultiTech® Systems

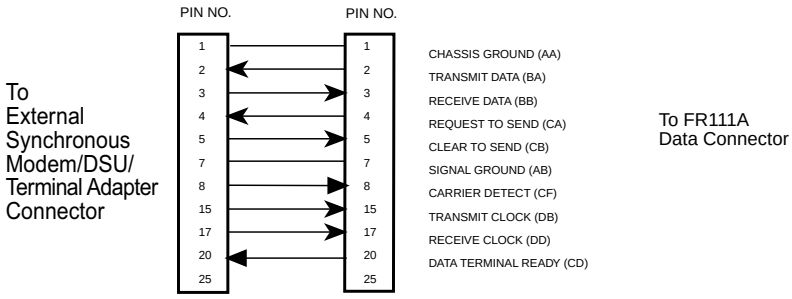
# Appendix A - Cabling Diagrams

## Data Cables

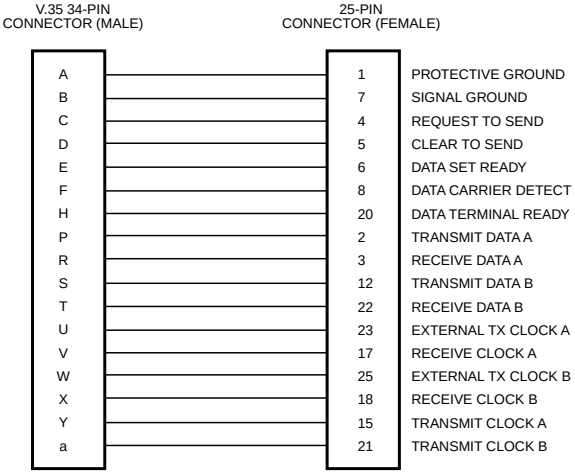



***Data Connector***

RS-232C/V.24 * Cable


PIN NO.
PIN NO.
To External Synchronous Modem/DSU/ Terminal Adapter Connector
1 2 3 4 5 7 8 15 17 20 25
1 2 3 4 5 7 8 15 17 20 25
CHASSIS GROUND (AA)
TRANSMIT DATA (BA)
RECEIVE DATA (BB)
REQUEST TO SEND (CA)
CLEAR TO SEND (CB)
SIGNAL GROUND (AB)
CARRIER DETECT (CF)
TRANSMIT CLOCK (DB)
RECEIVE CLOCK (DD)
DATA TERMINAL READY (CD)
To FR111A Data Connector

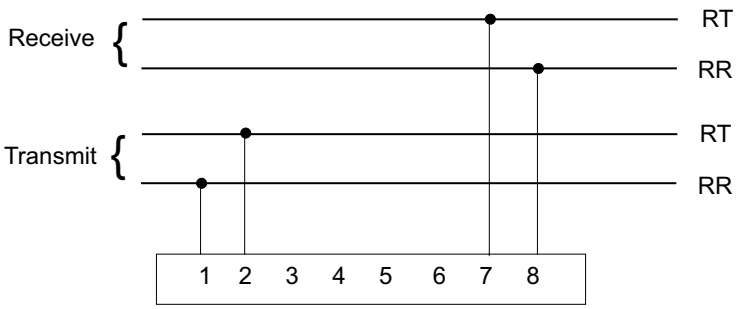
V.35 Adapter Cable**


V.35 34-PIN CONNECTOR (MALE)
25-PIN CONNECTOR (FEMALE)
A B C D E F H P R S T U V W X Y a
1 PROTECTIVE GROUND
7 SIGNAL GROUND
4 REQUEST TO SEND
5 CLEAR TO SEND
6 DATA SET READY
8 DATA CARRIER DETECT
20 DATA TERMINAL READY
2 TRANSMIT DATA A
3 RECEIVE DATA A
12 TRANSMIT DATA B
22 RECEIVE DATA B
23 EXTERNAL TX CLOCK A
17 RECEIVE CLOCK A
25 EXTERNAL TX CLOCK B
18 RECEIVE CLOCK B
15 TRANSMIT CLOCK A
21 TRANSMIT CLOCK B

* The FR111A RS-232C interface circuits have been designed to meet the electrical specificaitons given in EIA (Electronic Industries Association RS-232C and CCITT (Consultative Committee International Telegraph and Telephone) V.24 Standards.

** When configured for V.35 interface operation on the trunk, the V.35 adapter cable should be used. This cable uses a 25-pin female connector at one end and a 34-pin winchester male connector at the other end.

## Trunk Cable

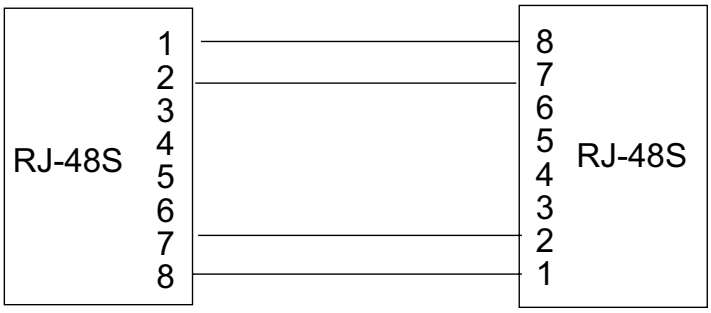



***RJ-48 Cable***

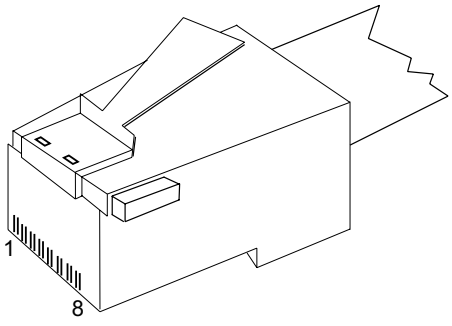
### Pin Identification

| Pin | Description | Destination |
|---|---|---|
| 1 | Transmit Pair | To Line |
| 2 | Transmit Pair | To Line |
| 3 | N/C | |
| 4 | N/C | |
| 5 | N/C | |
| 6 | N/C | |
| 7 | Receive Pair | From Line |
| 8 | Receive pair | From Line |

## Back-To-Back Cable




***Back-To Back Crossover***




***DDS RJ-48 Connector***

# Appendix B - Regulatory Information

## Class B Statement

## FCC Part 15

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help. This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference that may cause undesired operation.

**Warning**: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

# FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.
2. As indicated below, the suitable jack (Universal Service Order Code connecting arrangement) for this equipment is shown. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. A FCC compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.
4. The ringer equivalence number (REN) is used to determine the quantity of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the device not ringing in response to an incoming call. In most , but not all areas, the sum of the REN's should not exceed (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total REN's, contact the local telephone company.
5. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
6. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
7. If trouble is experienced with this equipment (the model of which is indicated below) please contact MultiTech Systems, Inc. at the address shown below for details of how to have repairs made. If the equipment is causing harm to the network, the telephone company may request you to remove the equipment from the network until the problem is resolved.
8. No repairs are to be made by you. Repairs are to be made only by MultiTech Systems or its licensees. Unauthorized repairs void registration and warranty.
9. This equipment should not be used on party lines or coin lines.
10. If so required, this equipment is hearing-aid compatible.

| | |
|---|---|
| Manufacturer: | MultiTech Systems, Inc. |
| Trade Name: | MultiFRAD |
| Model Number: | FR111A |
| FCC Registration Number: | AU7USA-24704-XD-N |
| Modular Jack (USOC): | RJ48 |
| Service Center in USA: | MultiTech Systems, Inc.<br>2205 Woodale Drive<br>Mounds View, MN 55112<br>(612) 785-3500 Fax (612) 785-9874 |

MultiFRAD™ 100-Series

One-Port Frame Relay Access Device with 56K DSU

# Glossary

MultiTech® Systems

## A

**Access:** The T1 line element made up of two pairs of wire that the telephone company brings to the customer premises. The Access portion ends with a connection at the local telco (LEC or RBOC).

**Accunet Spectrum of Digital Services (ASDS):** The AT&T 56 Kbps leased (private) line service. Similar to services of MCI and Sprint. ASDS is available in *n*x56/64 Kbps, where *n*=1, 2, 4, 6, 8, 12.

**ACK (ACKnowledgement code) (pronounced "ack"):** A communications code sent from a receiving modem to a transmitting modem to indicate that it is ready to accept data. It is also used to acknowledge the error-free receipt of transmitted data. Contrast with NAK.

**Adaptive Differential Pulse Code (ADCPM):** In multimedia applications, a technique in which pulse code modulation samples are compressed before they are stored on a disk. ADCPM, an extension of the PCM format, is a standard encoding format for storing audio information in a digital format. It reduced storage requirements by storing differences between successive digital samples rather than full values.

**Address:** A numbered location inside a computer. It's how the computer accesses its resources, like a video card, serial ports, memory, etc.

**AMI line coding:** One of two common methods of T1 line coding (with B8ZS). AMI line coding places restrictions on user data (B8ZS does not).

**Analog signal:** A waveform which has amplitude, frequency and phase, and which takes on a range of values between its maximum and minimum points.

**Analog Transmission:** One of two types of telecommunications which uses an analog signal as a carrier of voice, data, video, etc. An analog signal becomes a carrier when it is modulated by altering its phase, amplitude and frequency to correspond with the source signal. Compare with digital transmission.

**Application Program Interface (API):** A software module created to allow dissimilar, or incompatible applications programs to transfer information over a communications link. APIs may be simple or complex; they are commonly required to link PC applications with mainframe programs.

**ASCII (American Standard Code for Information Interchange) (pronounced "askey"):** A binary code for data that is used in communications and in many computers and terminals. The code is used to represent numbers, letters, punctuation and control characters. The basic ASCII code is a 7-bit character set which defines 128 possible characters. The extended ASCII file provides 255 characters.

**Asynchronous Transfer Mode (ATM):** A very high-speed method of transmission that uses fixed-size cells of 53 bytes to transfer information over fiber; also known as cell relay.

**AT Commands:** A standard set of commands used to configure various modem parameters, establish connections and disconnect. The "AT" is used to get the "attention" of the modem before the actual command is issued.

**Availability**: The measure of the time during which a circuit is ready for use; the complement of circuit "outage" (100% minus % outage = % available).

## B

**B7ZS (Bipolar 7 Zero Suppression) line coding:** One method of T1 line coding (see also "B8ZS" and "AMI"). B7ZS line coding does not place restrictions on user data (AMI does).

**B8ZS (Bipolar 8 Zero Suppression) line coding:** One of two common methods of T1 line coding (with AMI). B8ZS line coding does not place restrictions on user data (AMI does). A coding method used to produce 64 Kbps "clear" transmission. (See also "B7ZS" and "AMI" line coding)

**Backbone:** 1. A set of nodes and their interconnecting links providing the primary data path across a network. 2. In a local area network multiple-bridge ring configuration, a high-speed link to which the rings are connected by means of bridges. A backbone may be configured as a bus or as a ring. 3. In a wide area network, a high-speed link to which nodes or data switching exchanges (DSEs) are connected. 4. A common distribution core that provides all electrical power, gases, chemicals, and other services to the sectors of an automated wager processing system.

**Background:** An activity that takes place in the PC while you are running another application. In other words, the active user interface does not correspond to the 'background' task.

**Bandwidth:** The transmission capacity of a computer channel, communications line or bus. It is expressed in cycles per second (hertz), the bandwidth being the difference between the lowest and highest frequencies transmitted. The range of usable frequencies that a transmission medium will pass without unacceptable attenuation or distortion. Bandwidth is a factor in determining the amount of information and the speed at which a medium can transmit data or other information.

**Backward Explicit Congestion Notification (BECN):** A bit that tells you that a certain frame on a particular logical connection has encountered heavy traffic. The bit provides notification that congestion-avoidance procedures should be initiated in the opposite direction of the received frame. See also FECN (Forward Explicit Congestion Notification).

**Basic Rate Interface (BRI):** An ISDN access interface type comprised of two B-channels each at 64 Kbps and one D-channel at 64 Kbps (2B+D).

**Bell Operating Companies (BOC):** The family of corporations created during the divestiture of AT&T. BOCs are independent companies which service a specific region of the US. Also called Regional Bell Operating Companies (RBOCs).

**Bell Pub 41450**: The Bell publication defining requirements for data format conversion, line conditioning, and termination for direct DDS connection.

**Bell Pub 62310**: The Bell publication defining requirements for data format conversion, line conditioning, and termination for direct DDS connection.

**Binary Synchronous Communication (BSC):** A form of telecommunication line control that uses a standard set of transmission control characters and control character sequences, for binary synchronous transmission of binary-coded data between stations.

**Bit (Binary digIT):** A bit is the basis of the binary number system. It can take the value of 1 or 0. Bits are generally recognized as the electrical charge generated or stored by a computer that represent some portion of usable information.

**Bit Error Rate Test (BERT):** A device or routine that measures the quality of data transmission. A known bit pattern is transmitted, and the errors received are counted and a BER (bit error rate) is calculated. The BER is the ratio of received bits in error relative to the total number of bits received, expressed in a power of 10.

**Bit robbing**: The use of the least significant bit per channel in every sixth frame for signaling. The line signal bits "robbed" from the speech pat conveys sufficient pre-ISDN telephony signaling information with the remaining line signal bits providing sufficient line signaling bits for recreating the original sound. See "robbed bit signaling".

**Blue Alarm**: An error indication signal consisting of all 1s indicating disconnection or attached device failure. Contrast "Red Alarm" and "Yellow Alarm".

**Bps (bits per second):** A unit to measure the speed at which data bits can be transmitted or received. Bps differs from baud when more than one bit is represented by a single cycle of the carrier.

**Bridges:** 1. A functional unit that interconnects two local area networks that use the same logical link protocol but may use different medium access control protocols. 2. A functional unit that interconnects multiple LANs (locally or remotely) that use the same logical link control protocol but that can use different medium access control protocols. A bridge forwards a frame to another bridge based on the medium access control (MAC) address. 3. In the connection of local loops, channels, or rings, the equipment and techniques used to match circuits and to facilitate accurate data transmission.

**Buffer:** A temporary storage register or Random Access Memory (RAM) used in all aspects of data communications which prevents data from being lost due to differences in transmission speed. Keyboards, serial ports, muxes and printers are a few examples of the devices that contain buffers.

**Bus:** A common channel between hardware devices either internally between components in a computer, or externally between stations in a communications network.

**Byte:** The unit of information a computer can handle at one time. The most common understanding is that a byte consists of 8 binary digits (bits), because that's what computers can handle. A byte holds the equivalent of a single character (such as the letter A).

**C**

**Call Setup Time:** The time to establish a circuit-switched call between two points. Includes dialing, wait time, and CO/long distance service movement time.

**Carrier Group Alarm (CGA):** A T1 service alarm generated by a channel bank when an OOF condition occurs for a predefined length of time (usually 300mS to 2.5 seconds). The CGA causes the calls using a trunk to be dropped and for trunk conditioning to be applied.

**Carrier signal:** An analog signal with known frequency, amplitude and phase characteristics used as a transport facility for useful information. By knowing the original characteristics, a receiver can interpret any changes as modulations, and thereby recover the information.

**CCITT (Consultative Committee for International Telephone and Telegraph):** An advisory committee created and controlled by the United Nations and headquartered in Geneva whose purpose is to develop and to publish recommendations for worldwide standardization of telecommunications devices. CCITT has developed modem standards that are adapted primarily by PTT (post, telephone and telegraph) organizations that operate telephone networks of countries outside of the U.S. See also ITU.

**Central Office (CO):** The lowest, or most basic level of switching in the PSTN (public switched telephone network). A business PABX or any residential telephone connects to the PSTN at a central office.

**Centrex:** A multi-line service offered by operating telcos which provides, from the telco CO, functions and features comparable to those of a PBX for large business users. See also "Private Branch Exchange", "Exchange".

**Channel:** A data communications path between two computer devices. Can refer to a physical medium (e.g., UTP or coax), or to a specific carrier frequency.

**Channel bank:** A device that acts as a converter, taking the digital signal from the T1 line into a phone system and converting it to the analog signals used by the phone system. A channel bank acts as a multiplexer, placing many slow-speed voice or data transactions on a single high-speed link.

**Circuit-switched Network:** A technology used by the PSTN that allocates a pair of conductors for the exclusive use of one communication path. Circuit switching allows multiple conversations on one talk path only if the end-users multiplex the signals prior to transmission.

**Circuit switching:** The temporary connection of two or more communications channels using a fixed, non-shareable path through the network. Users have full use of the circuit until the connection is terminated.

**Clear Channel**: A transmission path where the full bandwidth is used (i.e., no bandwidth needed for signaling, carrier framing or control bits). A 64 Kbps digital circuit usually has 8 Kbps used for signaling. ISDN has two 64 Kbps circuits, and a 16 Kbps packet service of which part is used for signaling on the 64K channels.

**Client-Server:** In TCP/IP, the model of interaction in distributed data processing in which a program at one site sends a request to a program at another site and awaits a response. The requesting program is called a client; the answering program is called a server.

**Cluster Controller:** A device that can control the input/output operations of more than one device connected to it. A cluster controller may be controlled by a program stored and executed in the unit, or it may be entirely controlled by hardware.

**Committed Burst Size:** the maximum number of bits that the frame relay network agrees to transfer during any measurement interval

**Committed Information Rate (CIR):** An agreement a customer makes to use a certain minimum data transmission rate (in bps). The CIR is part of the frame relay service monthly billing, along with actual usage, that users pay to their frame relay service provider.

**Compression:** 1. The process of eliminating gaps, empty fields, redundancies, and unnecessary data to shorten the length of records or blocks. 2. In SNA, the replacement of a string of up to 64-repeated characters by an encoded control byte to reduce the length of the data stream to the LU-LU session partner. The encoded control byte is followed by the character that was repeated (unless that character is the prime compression character). 3. In Data Facility Hierarchical Storage Manager, the process of moving data instead of allocated space during migration and recall in order to release unused space. 4. Contrast with decompression.

**COMx Port:** A serial communications port on a PC.

**Congestion:** A network condition where there is too much data traffic. The ITU I.233 standard defines congestion management in terms of speed and burstiness.

**Congestion notification:** The function in frame relay that ensures that user data transmitted at a rate higher than the CIR are allowed to slow down to the rate of the available network bandwidth.

**Consecutive Severely Errored Seconds (CSES)**: An error condition that occurs when from 3 to 9 SES (Severely Errored Seconds) are logged consecutively.

**Customer Premise Equipment (CPE):** The generic term for data comm and/or terminal equipment that resides at the user site and is owned by the user with the following exclusions: Over voltage protection equipment, inside wiring, coin operated or pay telephones, "company-official" equipment, mobile telephone equipment, "911" equipment, equipment necessary for the provision of communications for national defense, or multiplexing equipment used to deliver multiple channels to the customer.

**D**

**D4**: the T1 4th generation channel bank.

**D4 channelization**: Refers to the compliance with AT&T TR 62411 for DS1 frame layout.

**D4 framing**: The T1 format for framing in AT&T D-Series channel banks, in which there are 12 separate 193-bit frames in a super-frame. A D4 framing bit is used to identify the channel and the signaling frame. Signalling for voice channels is carried in-band for every channel, along with the encoded voice. See "robbed-bit signaling".

**Data Communications Equipment (DCE):** Any device which serves as the portal of entry from the user equipment to a telecommunications facility. A modem is a DCE for the telephone network (PSTN) that is commonly on site at the user's premises. Packet Switched Networks have another level of DCE which is most often located at a central office.

**Data Link Connection Identifier (DLCI):** One of the six components of a frame relay frame. Its purpose is to distinguish separate virtual circuits across each access connection. Data coming into a frame relay node is thus allowed to be sent across the interface to the specified "address". The DLCI is confirmed and relayed to its destination, or if the specification is in error, the frame is discarded.

**Dataphone Digital Service (DDS):** A private line digital service that offers 2400, 4800, 9600 and 56 Kbps data rates on an inter-LATA basis by AT&T and on an intra-LATA basis by the BOCs.

**Data Service Unit (DSU):** A device that provides a digital data service interface directly to the data terminal equipment. The DSU provides loop equalization, remote and local testing capabilities, and a standard EIA/CCITT interface.

**Dedicated Line:** A communication line that is not switched. The term leased line is more common.

**Default:** This is a preset value or option in software packages, or in hardware configuration, that is used unless you specify otherwise.

**Device driver:** Software that controls how a computer communicates with a device, such as a printer or mouse.

**Digital Cross-connect System (DCS):** The CO device which splits and redistributes the T1 bandwidth. The DCS takes time slots from various T1 lines and alters them to provide the needed connectivity. DCS connections are made with software at an administrator's workstation.

**Digital Data:** Information represented by discrete values or conditions (contrast "Analog Data").

**Digital Loopback**: A technique used for testing the circuitry of a communications device. Can be initiated locally, or remotely (via a telecommunications device). The tested device decodes and encodes a received test message, then echoes the message back. The results are compared with the original message to determine if corruption occurred en route.

**Digital PBX:** A Private Branch Exchange that operates internally on digital signals. See also "Exchange".

**Digital Service, level 0 (DS0):** The world-wide standard speed (64 Kbps) for digital voice conversation using PCM (pulse coded modulation).

**Digital Service, level 1 (DS1):** The 1.544 Mbps voice standard (derived from an older Bell System standard) for digitized voice transmission in North America. The 1.544 Mbps consists of 24 digitally-encoded 64 Kbps voice channels (north America) and 2.048 Mbps (30 channels) elsewhere.

**Digital Signal:** A discrete or discontinuous signal (e.g., a sequence of voltage pulses). Digital devices, such as terminals and computers, transmit data as a series of electrical pulses which have discrete jumps rather than gradual changes.

**Digital Signaling Rates (DSn):** A hierarchical system for transmission rates, where "DS0" is 64 Kbps (equivalent to ISDN B channel), and DS1 is 1.5 Mbps (equivalent to ISDN PRI).

**Digital Transmission:** A method of electronic information transmission common between computers and other digital devices. Analog signals are waveforms: a combination of many possible voltages. A computer's digital signal may be only "high" or "low" at any given time. Therefore, digital signals may be "cleaned up" (noise and distortion removed) and amplified during transmission.

**Digitize:** To convert an analog signal to a digital signal.

**DIP switch (pronounced "dip switch"):** A set of tiny toggle switches, built into a DIP (dual in-line package), used for setting configurable parameters on a PCB (printed circuit board).

**Driver:** A software module that interfaces between the Operating System and a specific hardware device (i.e. color monitors, printers, hard disks, etc.). Also known as a device driver.

**Drop and Insert**: The process where a portion of information carried in a transmission system is demodulated ("Dropped") at an intermediate point and different information is included ("Inserted") for subsequent transmission.

**DTE (Data Terminating Equipment):** A term used to include any device in a network which generates, stores or displays user information. DTE is a telecommunications term which usually refers to PCs, terminals, printers, etc.

**DTMF (Dual-Tone MultiFrequency):** A generic push-button concept made popular by AT&T TouchTone.

**E**

**E&M:** A telephony trunking system used for either switch-to-switch, or switch-to-network, or computer/telephone system-to-switch connection.

**EIA:** The Electronics Industries Association is a trade organization in Washington, DC that sets standard for use of its member companies. (See RS-232, RS-422, RS-530.)

**Encapsulation:** A technique used by network-layer protocols in which a layer adds header information to the protocol data unit from the preceding layer. Also used in "enveloping" one protocol inside another for transmission. For example, IP inside IPX.

**Errored Seconds (ES):** Any second of operation that all 1.544M bits are not received exactly as transmitted. Contrast "Error Free Seconds".

**Error Free Seconds (EFS):** Any second of operation that all 1.544M bits are received exactly as transmitted. Contrast "Errored Seconds".

**ESF Error Event:** A T1 error condition that is logged when a CRC-6 error or an OOF error occurs.

**Ethernet:** A 10-megabit baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and transmission. Ethernet uses carrier sense multiple access with collision detection (CSMA/CD).

**Excess Zeros:** A T1 error condition that is logged when more than 15 consecutive 0s or less than one 1 bit in 16 bits occurs.

**Exchange:** A unit (public or private) that can consist of one or more central offices established to serve a specified area. An exchange typically has a single rate of charges (tariffs) that has previously been approved by a regulatory group.

**Exchange Area:** A geographical area with a single uniform set of charges (tariffs), approved by a regulatory group, for telephone services. Calls between any two points within an exchange area are local calls. See also "Digital PBX", "PBX".

**Exchange Termination (ET):** The carrier's local exchange switch. Contrast with "Loop Termination - LT".

**Explicit Congestion Management:** The method used in frame relay to notify the terminal equipment that the network is overly busy. The use of FECN and BECN is called explicit congestion management. Some end-to-end protocols use FECN or BECN, but usually not both options together. With this method, a congestion condition is identified and fixed before it becomes critical. Contrast with "implicit congestion".

**Extended Super Frame (ESF):** One of two popular formats for framing bits on a T1 line. ESF framing has a 24-frame super-frame, where robbed bit signaling is inserted in the LSB (bit 8 of the DS-0 byte) of frames 6, 12, 18 and 24. ESF has more T1 error measurement capabilities than D4 framing. ESF and B8ZS are typically both offered to provide clear channel service.

**F**

**Failed Seconds:** A test parameter where the circuit is unavailable for one full second.

**Failed Signal:** A T1 test parameter logged when there are more than 9 SES (Severely Errored Seconds).

**Fax (facsimile):** Refers to the bit-mapped rendition of a graphics-oriented document (fax) or to the electronic transmission of the image over telephone lines (faxing). Fax transmission differs from data transmission in that the former is a bit-mapped approximation of a graphical document and, therefore, cannot be accurately interpreted according to any character code.

**Firmware:** A category of memory chips that hold their content without electrical power, they include ROM, PROM, EPROM and EEPROM technologies. Firmware becomes "hard software" when holding program code.

**Foreground:** The application program currently running on and in control of the PC screen and keyboard. The area of the screen that occupies the active window. Compare with "background".

**Fractional T1 (FT1):** A digital data transmission rate between 56 Kbps (DS0 rate) and 1.544 Mbps (the full T1 rate - in North America). FT1 is typically provided on 4-wire (two copper pairs) UTP. Often used for video conferencing, imaging and LAN interconnection due to its low cost and relatively high speed. FT1 rates are offered in 64 Kbps multiples, usually up to 768 Kbps.

**Frequency:** A characteristic of an electrical or electronic signal which describes the periodic recurrence of cycles. Frequency is inversely proportional to the wavelength or pulse width of the signal (i.e., long wavelength signals have low frequencies and short wavelength signals yield high frequencies).

**Foreign Exchange (FX):** A CO trunk with access to a distant CO, allowing ease of access and flat-rate calls anywhere in the foreign exchange area.

**Foreign Exchange Office (FXO):** provides local telephone service from a CO outside of ("foreign" to) the subscriber's exchange area. In simple form, a user can pick up the phone in one city and receive a tone in the foreign city.

Connecting a POTS telephone to a computer telephony system via a T1 link requires a channel bank configured for the FX connection. To generate a call from the POTS set to the computer telephony system, a FXO connection must be configured.

**Foreign Exchange Station (FXS):** See FX, FXO. To generate a call from the computer telephony system to the POTS set, a FXS connection must be configured.

**Forward Explicit Congestion Notification (FECN):** A bit that tells you that a certain frame on a particular logical connection has encountered heavy traffic. The bit provides notification that congestion-avoidance procedures should be initiated in the same direction of the received frame. See also BECN (Backward Explicit Congestion Notification).

**Frame:** A group of data bits in a specific format to help network equipment recognize what the bits mean and how to process them. The bits are sent serially, with a flag at each end signifying the start and end of the frame.

**Frame Relay:** A form of packet switching that uses small packets and that requires less error checking than other forms of packet switching. Frame relay is effective for sending "bursty" data at high speeds (56/64K, 256K, and 1024 Kbps) over wide area networks. Frame Relay specifications are defined by ANSI documents ANSI T1.602, T1.606, T1S1/90-175, T1S1/90-213, and T1S1/90-214. In using frame relay, blocks of information (frames) are passed across a digital network interface using a "connection number" that is applied to each frame to distinguish between individual frames.

**Frame Relay Forum:** A nonprofit organization of 300+ vendors and service providers, based in Foster City, CA, that are developing and deploying frame relay equipment.

**Frame Relay Implementors Forum:** A group of companies supporting a common specification for frame relay connection to link customer premises equipment to telco network equipment. Their specification supports ANSI frame relay specs and defines extensions such as local management.

**Frame Relay Access Device (FRAD):** A piece of equipment that acts as a concentrator or frame assembler/dissassembler that can support multiple protocols and provide basic "routing" functions.

**G**

**Gateway:** 1. Afunctional unit that interconnects two computer networks with different network architectures. A gateway connects networks or systems of different architectures. A bridge interconnects networks or systems with the same or similar architectures. 2. A network that connects hosts.

**Graphical User Interface (GUI):** A type of computer interface consisting of a visual metaphor of a real-world scene, often of a desktop. Within that scene are icons, representing actual objects, that the user can access and manipulate with a pointing device.

**H**

**Handshaking:** A process that two modems go through at the time of call setup to establish synchronization over the data communications link. It is a synchronization and negotiation process accomplished by the exchange of predefined, mutually recognized control codes.

**High-level Data Link Control (HDLC):** An ISO standard, bit-oriented data communications protocol that provides nearly error-free data transfers.

**I**

**Hexadecimal:** A base 16 numbering system used to represent binary values. Hex uses the numbers 0-9 and the letters A-F: usually notated by an "h" (e.g., "4CF h", read "four charley fox, hex"). The result is that one hex digit represents a 4-bit value.

**Implicit congestion management:** A method of informing the terminal that the network is busy. This method relies on the end-system protocol to detect and fix the congestion problem. (TCP/IP is an example of a protocol using only implicit congestion management.) See also "explicit congestion management".

**In-band:** Refers to the type of signalling over the conversion path on an ISDN call. Contrast "out-of-band".

**Insufficient Ones:** A T1 error condition that is logged when less than one 1 in 16 0s or less than 12.5 % average 1s density is received.

**Inter Exchange Carrier (IEC):** The long distance company (LE) who's central office provides the point of reference for T1 access. Any common carrier authorized by the FCC to carry customer transmissions between LATAs.

**Internet:** Refers to the computer network of many millions of university, government and private users around the world. Each user has a unique Internet Address.

**Internet Address (IP Address):** A unique 32-bit address for a specific TCP/IP host on a network. Normally printed in dotted decimal format (e.g., 129.128.44.227).

**Internet Protocol (IP):** A protocol used to route data from its source to its destination in an Internet environment. The Internet Protocol was designed to connect to local area networks. Although there are many protocols that do this, IP refers to the global system of interconnecting computers. It is a highly distributed protocol (each machine only worries about sending data to the next step in the route).

**Internetwork Packet Exchange (IPX):** A NetWare communications protocol used to route messages from one node to another. IPX packets include network addresses and can be routed from one network to another. An IPX packet can occasionally get lost when crossing networks, thus IPX does not guarantee delivery of a complete message. Either the application has to provide that control, or NetWare's SPX protocol must be used.

**Interoperable:** Devices from different vendors that can exchange information using a standard's base protocol.

**I/O Addresses:** Locations within the I/O address space of your computer used by a device, such as an expansion card, a serial port, or an internal modem. The address is used for communication between software and a device.

**IRQ Level (Interrupt Request Level):** The notification a processor receives when another portion of the computer's hardware requires its attention. IRQs are numbered so that the device issuing the IRQ can be identified, and so IRQs can be prioritized.

**ISA (Industry Standards Architecture) (pronounced "ice a"):** The classic 8 or 16-bit architecture introduced with IBM's PC-AT computer.

**ISDN (Integrated Services Digital Network):** An International telecommunications standard for transmitting voice, video and data over a digital communications line. ISDN is a worldwide telecommunications service that uses digital transmission and switching technology to support voice and digital data communications. Frame relay was partially based on ISDN's data link layer protocol (LAPD). Frame relay can be used to transmit across ISDN services offering circuit-switched connection at 64 Kbps and higher speeds. Contrast Public Switched Telephone Network (PSTN).

**ITU-TSS (formerly CCITT):** International Telecommunications Union-Telecommunications Sector; the United Nations organization that prepares standards ("Recommendations") for resolving communications issues and problems.

**K**

**Key Telephone System (KTS):** Phone devices with multiple buttons that let you select incoming or outgoing CO phone lines directly. Similar in operation to a PBX, except a KTS you don't have to dial a "9" for a call outside the building.

**Key Service Unit (KSU):** A small device containing the switching electronics for a business key telephone system (KTS).

**Key Set**: A telephone set with several buttons for call holding, line pickup, intercom, autodialing, etc. Also called a touchtone phone (Ericsson) and a KTS (Key Telephone Set).

**L**

**LAPB:** Link Access Procedure Balanced; based on the X.25 Layer 2 specification. A full-duplex point-to-point bit-synchronous protocol commonly used as a data link control protocol to interface X.25 DTEs. LAPB is the link initialization procedure that establishes and maintains communications between the DTE and the DCE.

**LAPD:** Link Access Protocol for the D-Channel; based on the ISDN Q.921 specification. A full-duplex point-to-point bit-synchronous link-level protocol for ISDN connections; different from LAPB in its framing sequence. Transmission is in units called "frames", and a frame may contain one or more X.25 packets.

**Line Coding:** The representation of 1s and 0s on a T1 line. The two methods of line coding commonly used, B8ZS and AMI, differ in the restrictions placed on user data. T1 line coding ensures that sufficient timing information is sent with the digital signal to ensure recovery of all the bits at the far end. Timing information on the T1 line is included in the form of 1s in the data stream; a long string of 0s in the data stream could cause problems recovering the data.

**Line Termination (LT):** The electronics at the ISDN network side of the user/network interface that complements the NT1 at the user side. The LT and the NT1 together provide the high-speed digital line signals required for BRI access.

**Listed Directory Number (LDN):** The main number assigned by the telco; the number listed in the telephone directory and also provided by Directory Assistance. Some devices can have more than one LDN, such as ISDN devices that have one LDN for voice and another LDN for data.

**Local Area Network (LAN):** 1. A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. 2. A LAN does not use store and forward techniques. 3. A network in which a set of devices are connected to one another for a communication and that can be connected to a larger network.

**Local Access and Transport Area (LATA):** A post-divestiture geographical area generally equivalent to a Standard Metropolitan Statistical Area. At divestiture, the territory served by the Bell system was divided into approximately 161 LATAs. The Bell Operating Companies (BOCs) provide Intra-LATA services.

**Local Exchange Carrier (LEC):** The local phone company which provides local (i.e., not long distance) transmission services. AKA "telco". LECs provide T1 or FT1 access to LDCs (unless the T1 circuit is completely intra-LATA). Inter-LATA T1 circuits are made up of a combination of Access and Long Haul facilities.

**Local Management Interface (LMI):** A specification for frame relay equipment that defines status information exchange.
**Local Loop:** A transmission path, typically twisted-pair wire, between an individual subscriber and the nearest public telecommunications network switching center. The wires provide ISDN service, but require an NT1 at the user end and an LT at the network end. (AKA, "loop" or "subscriber loop".)

**Logical Link Control (LLC2):** In a local area network, the protocol that governs the exchange of transmission frames between data stations independently of how the transmission medium is shared. The LLC2 protocol was developed by the IEEE 802 committee and is common to all LAN standards.

**Logical Unit (LU):** A type of network accessible unit that enables end users to gain access to network resources and communicate with each other.

**Long Haul**: The T1 element that connects to the Access portion of the long distance company's (LDC's) central office. The LDC is commonly called the point of presence (POP). Each LDC has a number of POPs, located throughout the country. The LDC is also called an IEC (Inter Exchange Carrier).

**Long Haul Communications:** The type of phone call reaching outside of a local exchange (LE).

**M**

**Management Information Base (MIB):** A database of network management information used by the Common Management Information Protocol (CMIP) and the Simple Network Management Protocol (SNMP).

**Megacom:** An AT&T service with a normal WATS line (typically T1) between the customer premise and the AT&T serving class 4 CO are the customer's responsibility.

**MegaLink:** Bell South's leased T1 service.

**Message:** Associated with such terms as packet, frame, and segment. 1. In information theory, an ordered series of characters intended to convey information. 2. An assembly of characters and sometimes control codes that is transferred as an entry from an originator to one or more recipients.

**Modem:** A communications device that enables a computer to transmit information over a telephone line. It converts the computer's digital signals into analog signals to send over a telephone line and converts them back to digital signals at the receiving end. Modems can be internal and fit into an expansion slot, or external and connect to a serial port.

**Multiplexer (Mux):** 1. A device that takes several input signals and combines them into a single output signal in such a manner that each of the input signals can be recovered. 2. A device capable of interleaving the events of two or more activities or capable of distributing the events of an interleaved sequence to the respective activities. 3. Putting multiple signals on a single channel.

**Multiprotocol:** A device that can interoperate with devices utilizing different network protocols.

**Multithreading:** The ability of a software system to be able to handle more than one transaction concurrently. This is contrasted to the case where a single transaction is accepted and completely processed before the next transaction processing is started.

**N**

**Nailed Connection:** A permanent or dedicated circuit of a previously switched circuit or circuits.

**Nailed-up Circuit:** A semipermanent circuit established through a circuit-switching facility for point-to-point connectivity.

**NAK (Negative Acknowledgment):** Communications code used to indicate that a message was not properly received, or that a terminal does not wish to transmit. Contrast with ACK.

**Network:** A group of computers connected by cables or other means and using software that enables them to share equipment, such as printers and disk drives to exchange information.

**Node:** Any point within a network which has been assigned an address.

**O**

**Object-Orientated:** A method for structuring programs as hierarchically organized classes describing the data and operations of objects that may interact with other objects.

**Office Channel Unit - Data Port (OCU-DP):** The CO channel bank used as the interface between the customer's DSU and the channel bank.

**Off-hook:** The condition of a device which has accessed a phone line (with or without using the line). In modem use, this is equivalent to a telephone handset being picked up. Dialing and transmission are allowed, but incoming calls are not answered. Contrast "on-hook".

**Off Premise Extension (OPX):** An extension or phone that terminates in a location other than that of the PBX. Commonly used to provide a corporate member with an extension of the PBX at home.

**Ones Density:** the measure of the number of logical 1s on a T1 line compared to a given total number of bits on that line; used for timing information in data recovery in AMI and B8ZS.

**On-Hook:** The condition of a device which has not accessed a phone line. In modem use, this is equivalent to a telephone handset that has not been picked up. In other words, it can receive an incoming call. Contrast "off-hook".

**Open Shortest Path First (OSPF):** A hierarchical Interior Gateway Protocol (IGP) routing algorithm for IP that is a proposed standard for Internet. OSPF incorporates least-cost routing, equal-cost routing, and load balancing.

**Outage:** The measure of the time during which a circuit is not available for use due to service interrupt. Outage is the complement of circuit "availability" (100% minus % available = % outage).

**Out-of-band:** Signaling that is separated from the channel carrying the information (i.e., the voice/data/video signal is separate from the carrier signal). Dialing and various other "supervisory" signals are included in the signaling element. Contrast "In-band" signaling.

**Out of Frame (OOF):** A T1 alarm condition that is logged on the loss of 2, 3 or 4 of 5 consecutive FT framing bits.

**P**

**Packet:** 1. In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. The data, control signals and, possibly, error control information are arranged in a specific format. 2. Synonymous with data frame. 3. In TCP/IP, the unit of data passed across the interface between the Internet layer and the link layer. A packet includes an IP header and data. A packet can be a complete IP datagram or a fragment of an IP diagram. 4. In X.25, a data transmission information unit. A group of data and control characters, transferred as a unit, determined by the process of transmission. Commonly used data field lengths in packets are 128 or 256 bytes. 5. The field structure and format defined in the CCITT X.25 recommendation.

**Packet Assembler/Dissembler (PAD):** Used by devices to communicate over X.25 networks by building or stripping X.25 information on or from a packet.

**Packet Data:** The information format ("packetized") used for packet-mode calls.

**Packet Mode:** Refers to the switching of chunks of information for different users using statistical multiplexing to send them over the same transmission facility.

**Parity bit:** An extra bit attached to each byte of synchronous data used to detect errors in transmission.

**Permanent Virtual Circuit (PVC):** A connection between two endpoints dedicated to a single user. IN ISDN, PVCs are established by network administration and are held for as long as the user subscribes to the service.

**Physical Unit (PU):** The component that manages and monitors the resources (such as attached links and adjacent link stations) associated with a node, as requested by an SSCP via an SSCP-PU session. An SSCP activates a session with the physical unit in order to indirectly manage, through the PU, resources of the node such as attached links. This term applies to type 2.0, type 4, and type 5 nodes only.

**Point of Presence (POP):** The central office's end points of the long distance carriers.

**Point to Point Protocol (PPP):** A protocol that lets a PC user access TCP/IP (Internet member) using an ISDN terminal adapter or a high-speed modem over a standard telephone line.

**Port:** A location for input or output data exchange. Computers, muxes, etc. have ports for various purposes.

**Primary Rate Interface (PRI):** Used on ISDN. In North America, and Japan, PRI is one 64 Kbps D channel and 23 B channels. Elsewhere, it is one D channel and 30 B channels.

**Primitive:** An abstract representation of interaction across the access points indicating that information is being passed between the service user and the service provider. The OSI Reference Model defines four types of primitives: Request, Indication, Response and Confirm.

**Private Branch Exchange (PBX):** A telephone exchange located on the customer's premises. The PBX provides a circuit switching facility for telephone extension lines within the building, and access to the public telephone network. See also "Exchange".

**PROM (Programmable Read Only Memory - pronounced "prom"):** A permanent memory chip that can be programmed or filled by the customer after by the manufacturer has set initial values. Contrast with ROM.

**Protocol:** 1. A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. 2. In Open Systems Interconnection architecture, a set of semantic and syntactic rules that determine the behavior of entities in the same layer in performing communication functions. 3. In SNA, the meanings of and the sequencing rules for requests and responses used for managing the network, transferring data, and synchronizing the states of network components. 4. Synonymous with line control discipline.

**PSTN (Public Switched Telephone Network):** A worldwide public voice telephone network that is used as a telecommunications medium for the transmission of voice, data and other information.

**Public Data Network (PDN):** A packet-switched network that is available to the public for individual ("subscriber") use. Typically, controlled by a government or a national monopoly.

**Public Switched Telephone Network (PSTN):** The group of circuit-switching voice carriers, which are commonly used as analog data communications services.

**Pulse Code Modulation (PCM):** 1. In data communication, variation of a digital signal to represent information; for example, by means of pulse amplitude modulation (PAM), pulse duration modulation (PDM), or pulse position modulation (PPM). 2. Transmissions of analog information in digital form through sampling and encoding the samples with a fixed number of bits.

**Pulse dialing:** One of two methods of dialing a telephone, usually associated with rotary-dial phones. Compare with "tone dialing".

## Q

**Quantizing:** The process of analog-to- digital conversion by assigning a range, from the contiguous analog values, to a discrete number.

## R

**Random Access Memory (RAM):** A computer's primary workspace. All data must be stored in RAM (even for a short while), before software can use the processor to manipulate the data. Before a PC can do anything useful it must move programs from disk to RAM. When you turn it off, all information in RAM is lost.

**Rate Enforcement:** The concept in frame relay where frames sent faster than the CIR are to be carried only if the bandwidth is available, otherwise they are to be discarded. (The frame relay network assumes that anything exceeding the CIR is of low priority.) Rate enforcement makes sure that the network will not get so congested that it isn't able to meet the agreed on CIR

**Recognized Private Operating Agency (RPOA):** A corporation, private or government-controlled, that provides telecommunications services. RPOAs, such as AT&T, participate as nonvoting members in the CCITT.

**Red Alarm:** A T1 error condition generated when a local failure (e.g., loss of synchronization) exists for 2.5 seconds, causing a Carrier Group Alarm (CGA). See also "Blue Alarm" and "Yellow Alarm".

**Request for Comment (RFC):** A set of papers in which Internet standards (published and proposed), along with generally-accepted ideas, proposals, research results, etc. are published.

**Ring Down Box:** A device that emulates a CO by generating POTS calls for testing and product demos.

**Ring Down Circuit:** A tie line connecting phones where picking up one phone automatically rings another phone. A feature used for emergencies to alert the person at the other phone of the incoming call.

**RJ-11:** An industry standard interface used for connecting a telephone to a modular wall outlet; comes in 4- and 6-wire packages.

**RJ-48:** An 8-wire modular connector for voice and data circuits.

**Robbed Bit Signaling:** The popular T1 signaling mechanism where the A and B bits are sent by each side of the T1 termination and are "buried" in the voice data of each voice channel in the T1 circuit. Since the bits are "robbed" infrequently, voice quality is remains relatively uncompromised. See "bit robbing".

The robbed-bit signaling technique is used in D4 channel banks to convey signaling information. The eighth (least significant) bit of each of the 24 8-bit time slots is "robbed" every sixth frame to convey voice-related signaling information such as on-hook, off-hook, etc., for each channel.

**Router:** A device that connects two networks using the same networking protocol. It operates at the Network Layer (Layer 3) of the OSI model for forwarding decisions.

**Routing Information Protocol (RIP):** A distance vector-based protocol that provides a measure of distance, or hops, from a transmitting workstation to a receiving workstation.

**RS-232C:** An EIA standard for a serial interface between computers and peripheral devices (modem, mouse, etc.). It uses a 25-pin DB-25, or a 9-pin DB-9 connector. The RS-232 standard defines the purposes, electrical characteristics and timing of the signals for each of the 25 lines.

**RS-422:** The EIA standard for a balanced interface with no accompanying physical connector. RS-422 products can use screw terminals, DB-9, various DB-25, and DB-37 connectors.

**RS-530:** The EIA standard for the mechanical/electrical interface between DCEs and DTEs transmitting synchronous or asynchronous serial binary data. RS-530 provides for high data rates with the same connector used for RS-232; however, it is incompatible with RS-232.

## S

**Serial Port:** The connector on a PC used to attach serial devices (those that need to receive data one bit after another), such as a mouse, a printer or a modem. This consists of a 9- or 25-pin connector that sends data in sequence (bit by bit). Serial ports are referred to as "COMx" ports, where x is 1 to 4 (i.e., COM1 through COM4). A serial port contains a conversion chip called a "UART" which translates between internal parallel and external serial formats.

**Service:** The requirements offered by an RPOA to its customers to satisfy specific telecommunications needs.

**Severely Errored Seconds (SES):** Refers to a typical T1 error event where an error burst occurs (a short term, high bit-error rate that is self-clearing). Per the ITU-T (CCITT) G.821: any second in which the BER is less than $1x10^{-3}$.

**Signaling:** The process of establishing, maintaining, accounting for, and terminating a connection between two endpoints (e.g., the user premises and the telco CO). Central office signals to the user premises can include ringing, dial tone, speech signals, etc. Signals from the user's telephone can include off-hook, dialing, speech to far-end party, and on-hook signals.

In-band signaling techniques include pulse and tone dialing. With common channel signaling, information is carried out-of-band.

**Simple Network Management Protocol (SNMP):** TCP/IP protocol that allows network management.

**Simultaneous Voice Data (SVD):** A technology for letting a user send data via a modem, and use a handset to talk to another user at the same time over the same connection. The alternative, making a second call, can be expensive or even impossible. The uses for SVD are telecommuting, video conferencing, distant learning, tech support, etc.

**Stop Bit:** One of the variables used for timing in asynchronous data transmission. Depending on the devices, each character may be trailed by 1, 1.5, or 2 stop bits.

**Superframe (D4):** A T1 transmission format that consists of 12 DS1 frames, or 2316 bits. A DS1 frame consists of 193 bit positions. A frame overhead bit is in the first position, and it is used for frame and signaling phase alignment only.

**Subscriber Loop:** See "Local loop".

**Switched 56:** A circuit-switched (full duplex digital synchronous data transmission) service that lets you dial a number and transmit data to it at 56 Kbps. It is a relatively low cost service, widely used in North America for telecommuting, video conferencing and high speed data transfers. Many phone companies are (or will be) phasing out Switched 56 in favor of ISDN service.

**Switched Virtual Circuit (SVC):** A type of data transmission where the connection is maintained only until the call is cleared.

**Switched Line:** In communications, a physical channel established by dynamically connecting one or more discreet segments. This connection lasts for the duration of the call after which each segment may be used as part of a different channel. Contrast with leased line.

**Switched Network:** A network in which a temporary connection is established from one point via one or more segments.

**Synchronous Data Link Control (SDLC):** A discipline conforming to subsets of the Advanced Data Communications Control Procedures (ADCCP) of the American National Standards Institute (ANSI) and High-level Data Link Control (HDLC) of the International Organization for Standardization, for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex, or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop.

**Synchronous Transmission:** The transmission of data which involves sending a group of characters in a packet. This is a common method of transmission between computers on a network or between modems. One or more synchronous characters are transmitted to confirm clocking before each packet of data is transmitted. Compare to Asynchronous Transmission.

**Systems Network Architecture (SNA):** The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of networks.

**T**

**Tariff:** The rate/availability schedule for telephone and ISDN services from a regulated service provider.

**TCP/IP:** A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks.

**T Carrier:** The generic name for a digitally multiplexed carrier system. In the North American digital hierarchy, a T is used to designate a DS (digital signal) level hierarchy. Examples: T1 (DS1) is a 1.544 Mbps 24-channel designation. In Europe, T1 is called E1. The T Carrier system was originally designed for transmitting digitized voice signals, but has since been adapted for digital data applications.

**T1:** A digital transmission link capable of 1.544 Mbps. T1 uses two pairs of normal UTP, and can handle 24 voice conversations, each digitized at 64 Kbps. T1 is a standard for digital transmission in the U.S., Canada, Japan and Hong Kong. T1 is the access method for high-speed services such as ATM, frame relay, and SMDS. See also T Carrier, T1 line and FT1.

**T1 Channel Tests:** A set of diagnostics that vary by carrier, used to verify a T1 channel operation. Can include Tone, Noise Level, Impulse Noise Level, Echo Cancellors, Gain, and Crosstalk testing.

**T1 Framing:** To digitize and encode analog voice signals requires 8000 samples per second (twice the highest voice frequency of 4000 Hz). Encoding in an 8-bit word provides the basic T1 block of 64 Kbps for voice transmission. This "Level 0 Signal, as its called, is represented by "DS-0", or Digital Signal at Level 0. 24 of these voice channels are combined into a serial bit stream (using TDM), on a frame-by-frame basis. A frame is a sample of all 24 channels; so adding in a framing bit gives a block of 193 bits (24x8+1=193). Frames are transmitted at 8000 per second (the required sample rate), creating a 1.544M (8000x193=1.544M) transmission rate.

**T1 Line:** A digital communications facility that functions as a 24-channel pathway for data or voice. A T1 line is composed of two separate elements: the Access element and the Long Haul element.

**T1 Mux:** A device used to carry many sources of data on a T1 line. The T1 mux assigns each data source to distinct DS0 time slots within the T1 signal. Wide bandwidth signals take more than one time slot. Normal voice traffic or 56/64 Kbps data channels take one time slot. The T1 mux may use an internal or external T1 DSU; a "channel bank" device typically uses an external T1 CSU.

**Transmission Control Protocol / Internet Program (TCP/IP):** A multilayer set of protocols developed by the US Department of Defense to link dissimilar computers across dissimilar and unreliable LANs.

**Terminal:** The screen and keyboard device used in a mainframe environment for interactive data entry. Terminals have no "box", which is to say they have no file storage or processing capabilities.

**Terminal Adapter (TA):** An ISDN DTE device for connecting a non-ISDN terminal device to the ISDN network. Similar to a protocol converter or an interface converter, a TA connects a non-ISDN device between the R and S interfaces. Typically a PC card.

**Tie line:** A dedicated circuit linking two points without having to dial a phone number (i.e., the line may be accessed by lifting the telephone handset or by pushing a button).

**Time-Division Multiplexing (TDM):** Division of a transmission facility into two or more channels by allotting the common channel to several different information channels, one at a time.

**Time Slot:** One of 24 channels within a T1 line. Each channel has a 64 Kbps maximum bandwidth. "Time slot" implies the time division multiplexing organization of the T1 signal.

**Toll Call:** A call to a location outside of your local service area (i.e., a long distance call).

**Tone dialing:** One of two methods of dialing a telephone, usually associated with Touch-Tone® (push button) phones. Compare with pulse dialing.

**Topology:** Physical layout of network components (cables, stations, gateways, and hubs). Three basic interconnection topologies are star, ring, and bus networks.

**Transmission Control Protocol (TCP):** A communications protocol used in Internet and in any network that follows the US Department of Defense standards for internetwork protocol. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It assumes that the Internet protocol is the underlying protocol.

**Transport Layer:** Layer 4 of the Open Systems Interconnection (OSI) model; provides reliable, end-to-end delivery of data, and detects transmission sequential errors.

**Transport Protocol Data Unit (TPDU):** A transport header, which is added to every message, contains destination and source addressing information that allows the end-to-end routing of messages in multi-layer NAC networks of high complexity. They are automatically added to messages as they enter the network and can be stripped off before being passed to the host or another device that does not support TPDU's.

**Trunk:** Transmission links that interconnect switching offices.

**TSR (terminate and stay resident):** A software program that remains active and in memory after its user interface is closed. Similar to a daemon in UNIX environments.

**Tunneling:** Encapsulation data in an IP packet for transport across the internet.

**Twisted pair wiring:** A type of cabling with one or more pairs of insulated wires wrapped around each other. An inexpensive wiring method used for LAN and telephone applications, also called UTP wiring.

**U**

**UART (Universal Asynchronous Receiver/Transmitter) (pronounced "you art"):** A chip that transmits and receives data on the serial port. It converts bytes into serial bits for transmission, and vice versa, and generates and strips the start and stop bits appended to each character.

**UNIX:** An operating system developed by Bell Laboratories that features multiprogramming in a multi-user environment.

**Unshielded Twisted Pair (UTP):** Telephone-type wiring. Transmission media for 10Base-T.

**V**

**V.25bis:** An ITU-T standard for synchronous communications between a mainframe or host and a modem using HDLC or other character-oriented protocol.

**V.54:** The ITU-T standard for local and remote loopback tests in modems, DCEs and DTEs. The four basic tests are:

- local digital loopback (tests DTE send and receive circuits),
- local analog loopback (tests local modem operation),
- remote analog loopback (tests comm link to the remote modem), and
- remote digital loopback (tests remote modem operation).

**Virtual Circuit:** A logical connection. Used in packet switching wherein a logical connection is established between two devices at the start of transmission. All information packets follow the same route and arrive in sequence (but do not necessarily carry a complete address).

# Index


## A

About the Internet 43
About the Multi-Tech Fax-Back Service 43

## B

Back Panel
  Data Connector 9
  Power Connector 9
  Trunk Connector 9
Bulletin Board System (BBS) 42

## C

Cabling Diagrams 46
  Data Port V.35 Adapter Cable 46
  Trunk Cable 47
Cabling Procedure 15
Committed Information Rate 23
Committed Information Rate (CIR) 30
Configuration Port Setup 27
Congestion Management 30

## D

Data Port 46
  Adapter Cable 46
  Configuration 32
  Specifications 11
  Statistics 37
  V.35 Adapter cable 46
Default Setup 27
Download Default Setup 27
Download Factory Defaults 26
Download Firmware 26, 27
Download User Defaults 26

## E

Electrical Specifications 11
Enclosure Mounting Scew Locations 17
Environmental Specifications 11
Excess Burst Rate 23
Excess Burst rate (Be) 30

## F

FCC Part 68 Telecom 49
Firmware 26
Frame Relay
  Compatibility 11
  Setup 29
  Statistics 35
Frame Relay Setup
  DLCI Selection 30
  Management Type Parameters 29
Front Panel 8
  Description 8
FTP Site 43

## G

Glossary 51

## I

Installation
  Windows 3.1 20
  Windows 95 20
  Windows NT 20
Installing MultiFRAD Software 19
Interface Type 24
Internet 43
  FTP Site 43
  Multi-Tech Web Site 43

## L

Limited Warranty 40

## M

Multi-Tech Web Site 43
MultiFRAD 100-series
  Back Panel 9
  Configuration 28
  Installing the Software 20
  Overview 6
  Specifications 11
  Unpacking 14
MultiFRAD Software 26
  Modifying the configuration 26
  Utilities 26
MultiFRAD Utilities 26
  Configuration Port Setup 27
  Download Factory Defaults 26
  Download Firmware 27
  Download User Defaults 26
  Uninstall MultiFRAD Configuration 27

## O

On-line Warranty Registration 40
Ordering accessories 43

## P

Physical Specifications 11
Proxy Server 2.01 Program Group 26
Proxy Server Configuration 28

## R

Recording MultiFRAD Information 41
Regulatory Information 48

## S

Safety 14
Safety warning 14
Service 41
Setup Menu
  Data Port Configuration 32
  Frame Relay Setup 29
  WAN Port Setup 31, 37
Shunt Positions 17
Software
  Description 26
  Uninstall 27
Statistics 35
  Data Port 37
  Frame Relay 35
  Wide Area Network (WAN) 34

## T

Tech Support 41
The Multi-Tech BBS 42
Throughput Mode 30
Trunk Cable 47
Trunk Specifications 11

## U

Uninstall MultiFRAD Configuration 27
Uninstall Proxy Server Configuration 27
Unpacking the MultiFRAD 100 14

## W

WAN Port Configuration 22
WAN Port Setup 31, 37
WAN Statistics 34
Warranty 40
  On-line Registration 40